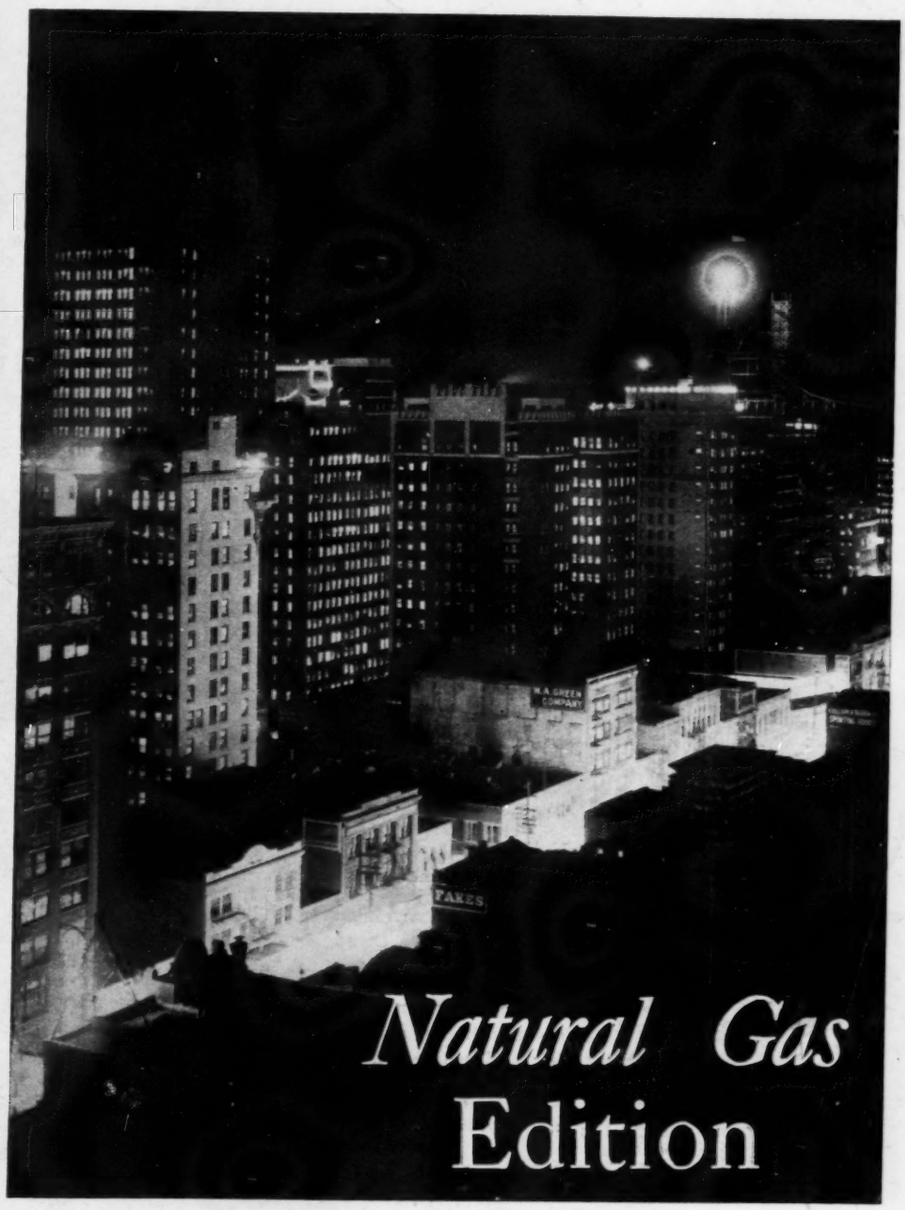
WESTERN GAS

May
1928

20 Cents
the Copy



Natural Gas Edition

Downtown Dallas, Texas, alight for visiting natural gas men of the nation, who meet there May 7, 8, 9, and 10 in annual convention

LIBRARY OF CONGRESS
MAY

A MONTHLY JOURNAL DEVOTED TO THE
WESTERN GAS & APPLIANCE INDUSTRIES

The Type R

Nordstrom Valve

The desirable valve for curb and meter service

Patented "Sealdport" Lubrication

MERCO
TRADE MARK

Should not be confused with our standard valves. It is designed to fill a need for less severe services and to sell at a lower price. Sizes—¾", 1", 1¼" and 1½".

Patented "Sealdport" type of lubrication allows plug to be turned through 360° without allowing line pressure to force lubricant out of valve.

Valve shank indicates when valve is in open or closed position.

Complete grease ring around both inlet and outlet ports of valve prevents leakage through valve or to exterior. Lubricant in convenient stick form, to meet each operating condition.

No operations necessary to seat or unseat plug, except turning down lubricant screw which performs function of unseating, greasing and sealing valve.

Type R is recommended for services not to exceed 100 lbs. air or water pressure or 50 lbs. gas or gasoline.

Ask for Specification Sheets

MERCO NORDSTROM VALVE CO.

SUBSIDIARY OF THE MERRILL CO.

Engineers—Manufacturers

San Francisco.....121 Second St.
Ceveland .....Engineers Bldg.
New Orleans..Masonic Temple Bldg.
Chicago .....Peoples Gas Bldg.
New York City.....11 W. 42nd St.
Houston .....Petroleum Bldg.

Factories: Oakland, Calif., and Belleville, N. J. Agencies in principal cities.

THE COMPANIES whose advertisements appear in this Section are exhibiting the latest improvements in equipment and appliances at the NATURAL GAS EXHIBITION, held in Dallas, Texas, May 7th to 10th:

Name	*Booth Number*	*Attendant At Booth*
AMERICAN GAS PRODUCTS	512-514	C. W. Hazelton
THE ARCO COMPANY	422	F. T. Jamieson, D. S. Picard, Dr. G. B. Sawyer
THE CLEVELAND TRENCHER COMPANY	502-504	V. S. Penote, J. R. Overs
THE CONNERSVILLE BLOWER COMPANY	600-A	J. S. Tatman, C. R. Houghton, C. B. Coldwell
THE CONTINENTAL SUPPLY COMPANY	308-310	Ed J. Drake, H. C. Elder, C. E. Ross, F. John, M. D. Smith, C. S. Vogel
THE CHAPLIN FULTON MFG. CO.	336	Wm. McKee, J. P. Kelly, W. S. Ralston, F. N. Goedert
S. R. DRESSER MANUFACTURING CO.	309-311	F. A. Miller, F. N. Smith, W. F. Miller, M. N. Davis, C. T. Davis, G. E. Seaberg
THE ESTATE STOVE COMPANY	431-433	
EVERLASTING PAINT & SALES COMPANY	602	J. M. Page
THE FOXBORO COMPANY	424-426	C. B. Bellis, W. D. Emery, C. E. Mason, J. B. McMahon, C. L. Bryan, R. L. Mallory
GENERAL GAS LIGHT COMPANY	117-119	R. H. Nowlin, Cameron Brown, James M. Coles
HOPE ENGINEERING & SUPPLY COMPANY	524-526	Wright L. Felt, D. W. McKay, W. B. Jennings
HILL, HUBBELL COMPANY	231	R. H. Hubbell, G. T. Langan, E. R. McCarthy
INGERSOLL-RAND COMPANY	103-105	
THE LATTIMER STEVENS COMPANY	330	H. B. Dugger, F. E. Stevens, C. W. Stevens, E. M. Stevens
LONE STAR GAS COMPANY	211-213	
MUELLER COMPANY	319-321	
LEE B. METTLER	440	Lee B. Mettler, Roy Cookston, R. F. Cathcart, C. A. Wendt
METRIC METAL WORKS	411-413-415	F H. Payne, F. J. Hart, Larmour Adams, J. C. Diehl
PAYNE FURNACE & SUPPLY COMPANY, Inc.	141	R. W. Campbell
PITTSBURGH EQUITABLE METER CO.	312-314	L. C. Duncan
RELIANCE MANUFACTURING COMPANY	409	Westcott & Greis
REYNOLDS GAS REGULATOR COMPANY	222	M. B. Reynolds, Floyd Gaunt, R. C. Hughes
GEORGE D. ROPER CORPORATION	534	J. C. Mansfield
ROBINSON ORIFICE FITTING COMPANY	506	
SAFETY GAS MAIN STOPPER COMPANY	225	Circle Corporation
SPENCER THERMOSTAT COMPANY	530	R. H. Maurer
SOUTHWESTERN PIPE JOINT & ENG. CO.	218	H. Y. Carson
THE SPRAGUE METER COMPANY	436-438	H. A. Kahler, E. C. Falvey, W. P. Hutchinson
U. S. CAST IRON PIPE & FOUNDRY CO.	600	
WARD HEATER COMPANY	332	M. Lancaster, H. E. Hertner, S. Sproat, E. M. Ries
WESTCOTT VALVE COMPANY	306	A. W. Thompson, A. V. Wadsworth
WESTCOTT & GREIS, INCORPORATED	409	F. I. Thompson, H. W. Wahl, J. H. Satterwhite
WESTERN GAS	304	Jay Jenkins, Craig Espy, W. G. Russell

May, 1928, Volume IV, Number 5. WESTERN GAS is published by Western Business Papers, Inc., at 124 West Fourth Street, Los Angeles, California. Subscription price (in advance) 20 cents the copy; $2.00 per year; 3 years $5.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, California, under the Act of March 3, 1879.

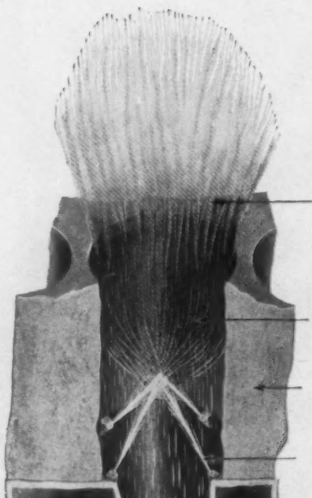
Investigate

Mettler Entrained Combustion Gas Burners

Nearly 10,000 of them now in use burning over 20,000,000 cubic feet of gas per hour

There is a Good Reason

Study the cuts below



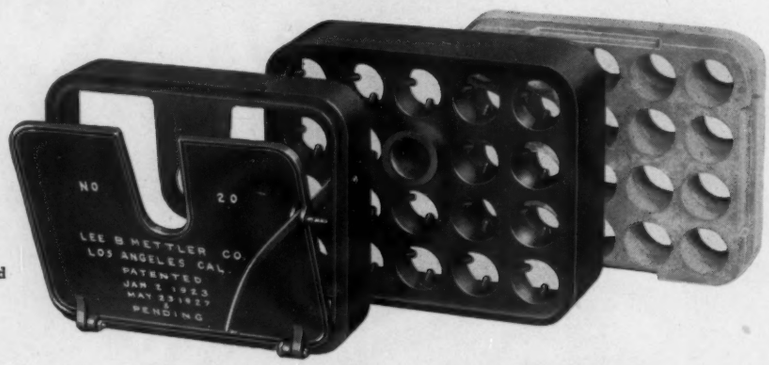
Complete combustion close to end of burner

Gas and air thoroughly mixed from violent agitation, then instantly fired

Refractory mixing block prevents overheating of gas manifold

Multiple gas jets

Gas manifold



Only *three parts* to a *Mettler Burner*
***Nothing* to burn out or get out of order**
Will last a life time

It is not what enthusiastic salesmen claim—
It is not what expert Combustion Engineers can do—
It is what **your Boiler Room Operator** can do that counts, and with Mettler Entrained Combustion Gas Burners he can't fail to

Reduce Your Gas Bill!

Mettler Burners are designed on the Multi-Unit Multi-Jet Principle, producing thorough mixture of gas and air, resulting in complete combustion close to the end of the burner with a minimum of excess air and maximum furnace temperatures.

Mettler Entrained Combustion Gas Burners
FOR ALL Purposes, Kinds of gas, Pressures
406 S. Main St. **LEE B. METTLER CO.** Los Angeles, Cal.

WELCOME

TO

DALLAS

for

The Big 1928

Gas Convention

May 7 to 10

Wel'-come!

Lone Star Gas Co.

General Offices: Lone Star Bldg., 1915 Wood St.

Dallas, Texas

Texas' Largest Distributors of Natural Gas

We'll Be at Booth 225 in Dallas

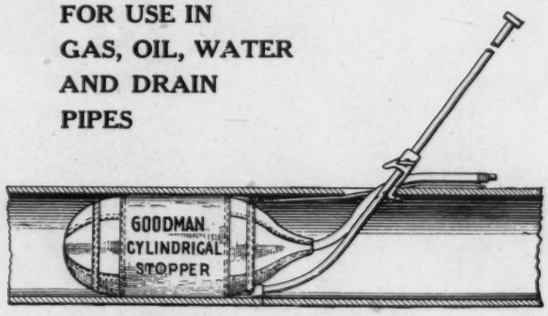
FOR SAFETY'S SAKE USE

Gas Main Bags

THREE TYPES

TYPE A—Seamless.
TYPE B—Reinforced Seams
TYPE C—Canvas Covered

FOR USE IN
GAS, OIL, WATER
AND DRAIN
PIPES



Air Line Mask

With or without Blower.

Mask and Blower in separate cases.

Blower will supply sufficient air for 4 masks.

Safety Gas Main Soap Tape

For bandaging broken pipe. Also binding tape to cover soap tape bandage.

Safety Gas Main Stopper Co.

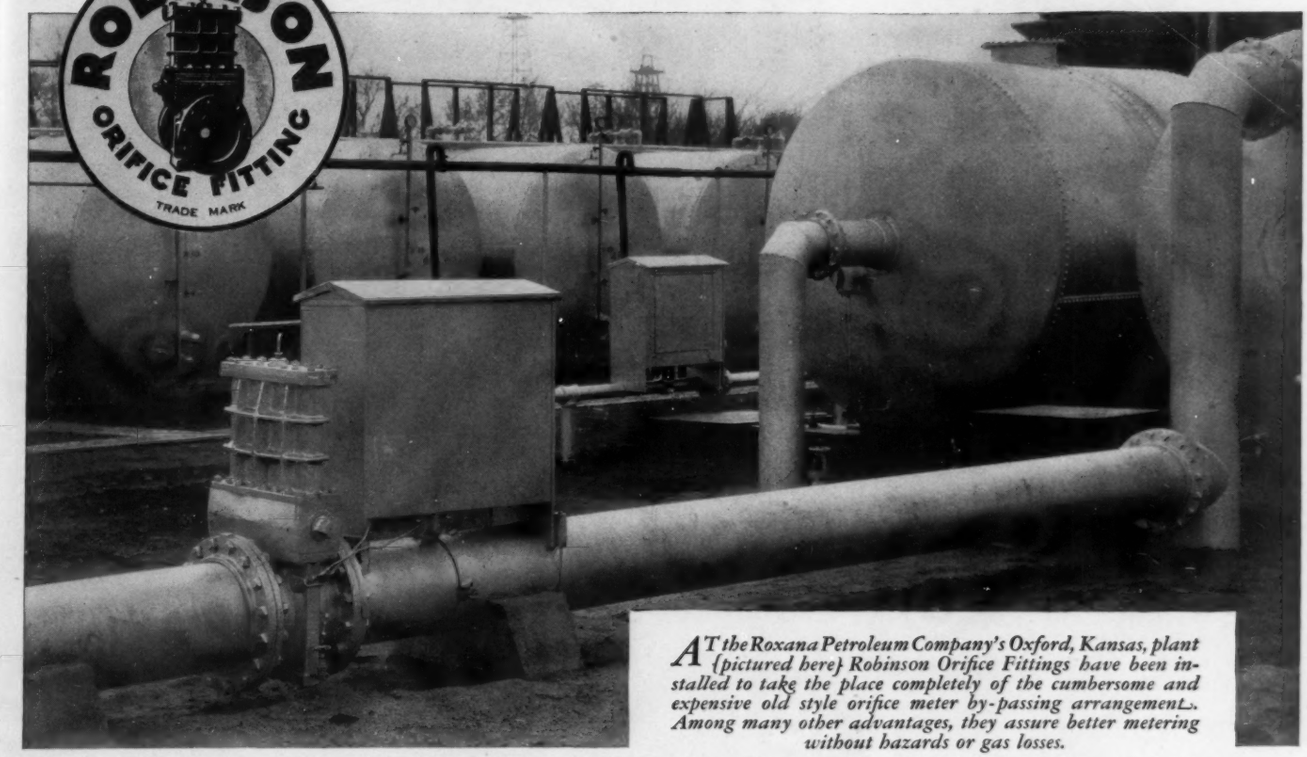
523 Atlantic Avenue, BROOKLYN, N. Y.

New England Representative
The Eastern Service Co., Boston, Mass.

Texas-Louisiana Representative
Maintenance Engineering Corp.
Box 1402, Houston, Texas

Pacific Coast Representative
C. B. Babcock Co., San Francisco, Calif.

OVER 8500 IN USE



AT the Roxana Petroleum Company's Oxford, Kansas, plant (pictured here) Robinson Orifice Fittings have been installed to take the place completely of the cumbersome and expensive old style orifice meter by-passing arrangement. Among many other advantages, they assure better metering without hazards or gas losses.

You *expect* to find Robinson Fittings in a plant *like this!*

See Booth 506

. . . at the Annual Convention, Natural Gas Department, American Gas Association, Dallas, Tex.
May 7th to 10th

IT would surprise an oil or gas man familiar with the Robinson Orifice Fitting to *not* find this efficient and economical equipment in such a plant as that pictured above. Oil and gas companies that realize the greater profits in greater efficiency are the ones installing Robinson Fittings. If you are not familiar with Robinson advantages request our new catalog—it contains complete details.

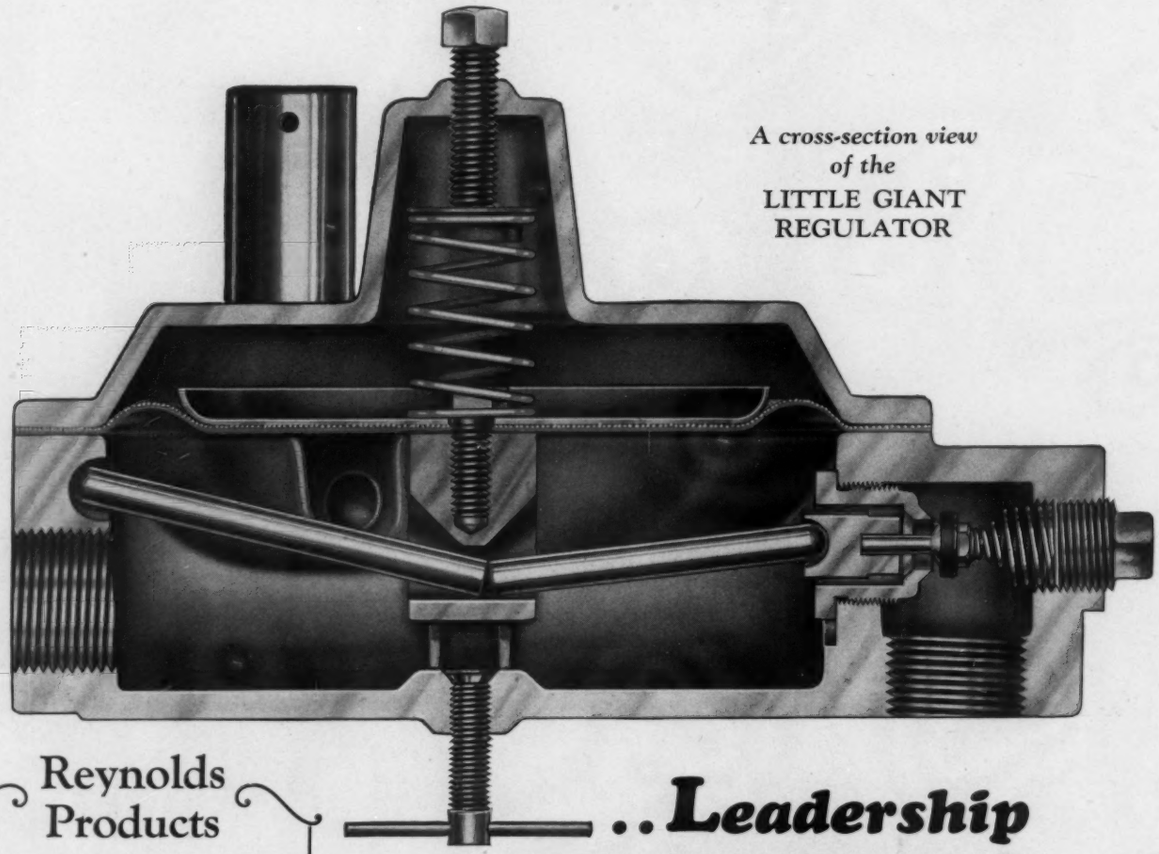
ROBINSON ORIFICE FITTING COMPANY
1435 SANTA FE AVENUE · LOS ANGELES, CALIFORNIA

California Distributors:
Westcott & Greis, Inc., Los Angeles
Jensen Instrument Co., Los Angeles

Mid-Continent Distributors:
B & A Specialty Co., Tulsa, Houston
Westcott & Greis, Inc., Tulsa, Dallas

ROBINSON ORIFICE FITTING

Reynolds



A cross-section view of the LITTLE GIANT REGULATOR

Reynolds Products

for all kinds of Pressure Reduction—for either artificial or natural gas.

Governors—
- Intermediate Pressure
- Triple Outlet
- Holder
- Toggle Type Street

Regulators—
- High Pressure Service
- Low Pressure Service
- Intermediate Pressure
- High Pressure Line
- Single and Double District Station

Valve—
- Automatic Quick-Closing Anti-Vacuum

COMPANY MEMBER OF AMERICAN GAS ASSOCIATION

..Leadership Through Service

REYNOLDS LITTLE GIANT GAS REGULATOR has proven its superiority in handling high pressures up to 300 lbs., reducing to inches or pounds, for more than thirty years. A study of the design and construction will convince you of its durability. In common with other Reynolds Products, a rigid inspection insures that only regulators which are ready for immediate use are ever shipped. LITTLE GIANT Regulators are made in 1″ and 1¼″ sizes. A specially designed cut-off, which acts as a safety valve on the 1″ size, insures absolute safety. (See cross-section view.) This automatic safety valve closes when the gas pressure leaves the high pressure line and remains closed until reopened by hand. Many gas companies are finding that the LITTLE GIANT will solve their high pressure problems. Our Engineering Department is at your service.

Reynolds Gas Regulator Company
Anderson, Indiana

Our booth number at the Dallas Show is 222. Come in and get acquainted.

RECOGNIZED LEADERSHIP IN GAS CONTROL SINCE 1892

Installation for one of the largest gas companies in the middle west. 12" plain end deLavaud pipe with Dresser type couplings.

The smooth exterior of deLavaud Cast Iron Pipe makes it ideal for use with special couplings

IT has long been a standard practice to use couplings of the Dresser type for high pressure lines.

For water or natural gas lines this joint may be equipped with regular rubber gaskets. For lines conveying manufactured gas, lead tipped gaskets are generally specified.

Write for descriptive literature on special couplings for all purposes

United States Cast Iron Pipe and Foundry Company

General Offices:
Burlington, New Jersey

SALES OFFICES

Philadelphia: 1421 Chestnut St.
Chicago: 122 So. Michigan Blvd.
Birmingham: 1st Ave. & 20th St.
Buffalo: 957 East Ferry Street
Cleveland: 1150 East 26th Street
New York: 71 Broadway
San Francisco: 3rd & Market Sts.
Pittsburgh: 6th & Smithfield Sts.
Dallas: Akard & Commerce Sts.
Kansas City: 13th & Locust Sts.
Minneapolis: 6th St. & Hennepin Ave.

Bitulumin Reduces Evaporation Increases Surfaces Protection

Read These Facts

OFFICIAL COMPARATIVE TEST OF EFFECT OF TANK COLORS ON EVAPORATION LOSSES OF CRUDE OIL

Serial No. 2677, March 1925

Report by Ludwig Schmidt, Associate Petroleum Engineer, U. S. Bureau of Mines
Duration of tests: January 1924 to January 1925

Color	Initial Gauge Barrels	Loss by Barrels	Evaporation %	Loss in Gravity A. P. I.
Black	52058	649	1.24%	.60
Red	53294	609	1.14%	.50
Gray	53192	547	0.99%	.30
Aluminum	53418	447	0.83%	.20

Bitulumin successfully resists paint's two worst enemies, sunlight and moisture. It is largely immune to Ultra Violet rays which break down paint surface, allowing moisture to penetrate.

Bitu lumin turns away approximately 86% of harmful sunrays, thus keeping tanks and contents cooler and minimizing evaporation.

Bitulumin forms a light resisting, durable and moisture proof surface. It will outlast the best lead and zinc paints by two to one.

Bitulumin while widely used for painting oil storage is equally efficient on tank cars, metal buildings, refinery equipment, still towers, water tanks, bridges, etc.

Bitulumin, put up in double containers to insure fresh mixing, is manufactured by Hill Hubbell & Company, manufacturers of a special line of paints for the oil industry.

HILL, HUBBELL & COMPANY

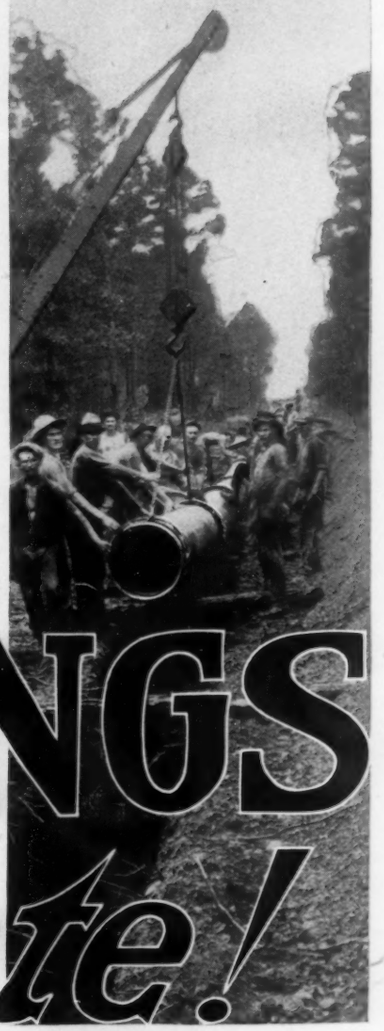
Manufacturers of
Highest Grade Oil Industry Paints and Pipe Line Coatings
Factories at SAN FRANCISCO and TULSA
District Offices:

SAN FRANCISCO
SEATTLE
LOS ANGELES
TULSA
PORTLAND
HOUSTON
NEW YORK CITY
BALTIMORE

DRESSER

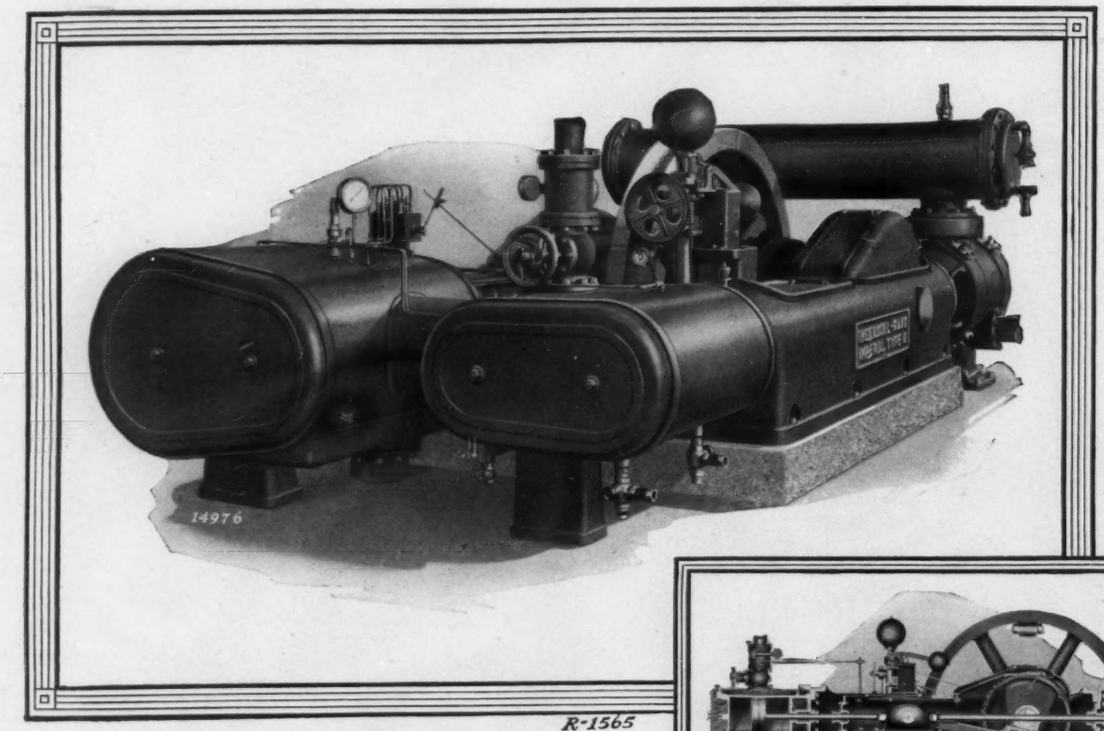
DURABLE RESILIENT ECONOMICAL SIMPLE SAFE EFFICIENT RELIABLE

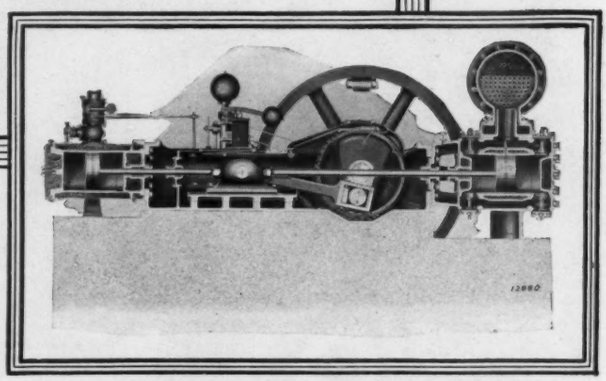
A Combination of Essential Factors for Satisfactory Service



COUPLINGS

Dominate!





The Type XPV Steam-Driven Compressor with Automatic Cut-off Pressure Regulator

Sustained Efficiency over a Wide Range of Loads and Pressures

The Ingersoll-Rand Type XPV Steam-Driven Compressor has an exceptionally high initial efficiency, and its balanced piston valves with light compensating rings sustain this high efficiency during the normal life of the machine.

The same high efficiency is also maintained at the varying load points, since the automatic governor regulates the speed of the Compressor through the high-pressure steam cut-off.

An extremely wide load range is characteristic of the XPV machine. In addition, its discharge pressure can be regulated by simply shifting a weight on the governor lever arm. This feature makes XPV units ideal for a wide variety of air and gas applications.

Representatives of the Company are located all over the world. They will be glad to assist you with your Compressor problems.

INGERSOLL-RAND COMPANY—11 BROADWAY, NEW YORK CITY

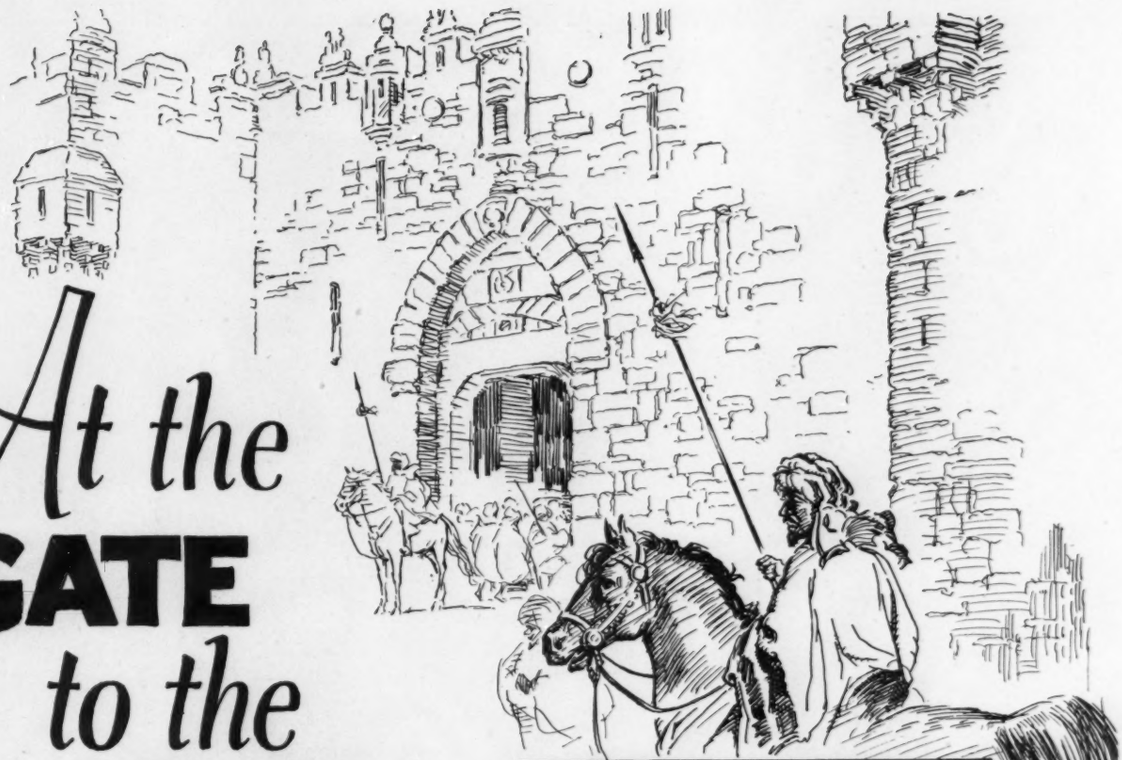
1460 East Fourth Street
Los Angeles, Calif.

526 First Avenue, South
Seattle, Washington

Rialto Bldg.,
San Francisco, Calif.

893-C

Ingersoll-Rand



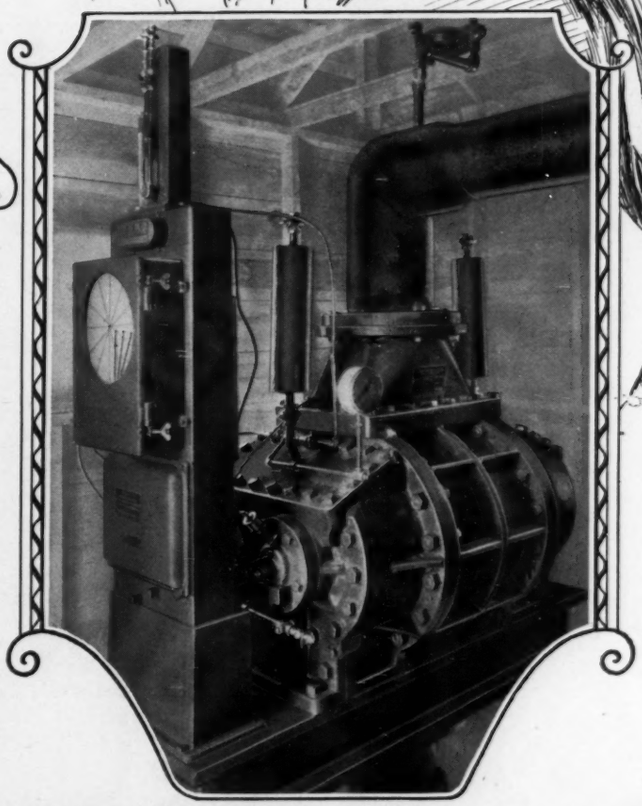
At the **GATE** *to the* **CITY**

Where gas from the pipe line is delivered into the city distribution system, is the place you need those dependable watchmen, the

Connersville Meters

Rugged in construction, of simple design and with unvarying displacement, they will serve you with as little worry on your part as is the Connersville Meter on the city gate at Lima, Ohio.

Investigate the record of Connersville Meters.



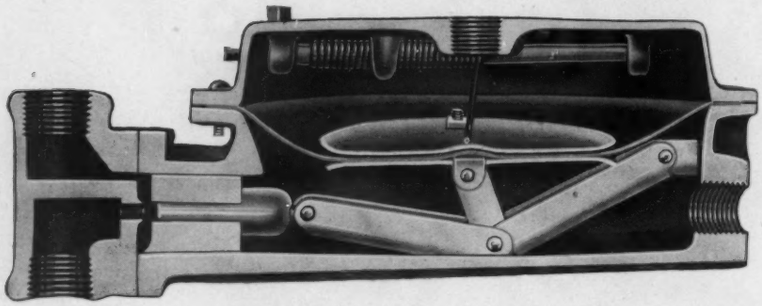
The Connersville Blower Co.

Michigan Ave., at 16th St.
Connersville, Indiana
SALES OFFICES
623 Monadnock Block, Chicago
114 Liberty St., New York
Chamber of Comerce, Pittsburgh

CONNERSVILLE

Blowers · Gas Pumps · Meters · Cycloidal Pumps

Reliance Regulator



The Reliance Regulator is famous for its positive lockup, close regulation and great capacity.

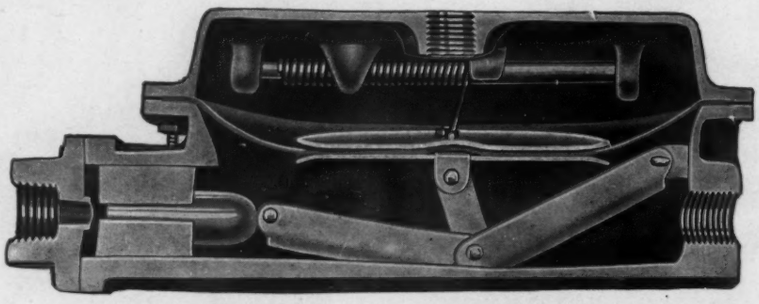
The toggle joint leverage (a patented device) gives the most positive action known and is in use on over a half million regulators. No toggle has ever been bent, broken or distorted. By its use, pressures can be safely reduced from 200 pounds inlet to 6 water inches.

Valve seats accessible. Can be changed in five minutes.

No dead weights to injure diaphragm in handling or shipping, or to cause breakage.

The Reliance is noted for low cost of upkeep. Records kept by a prominent gas company of California over a term of years show cost for servicing Reliance less than one-half that of any other make.

Prompt deliveries guaranteed. Capacity of plant, 500 house type regulators per day.



Mid Continent Representatives

WESTCOTT & GREIS, *Inc.*

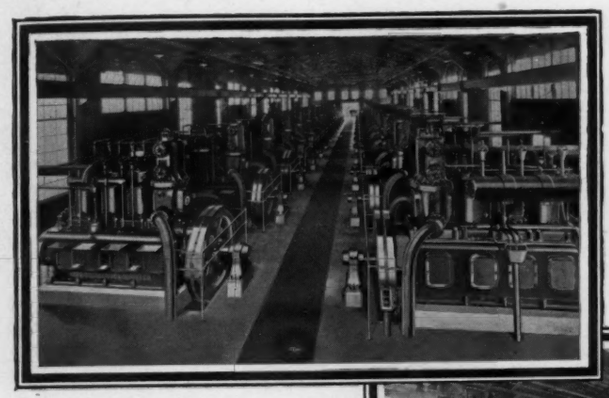
Tulsa **Los Angeles** **Dallas**

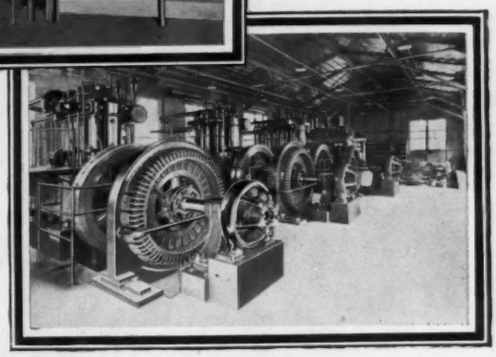
Eastern Representative

Isbell-Porter Company, Newark, N. J.

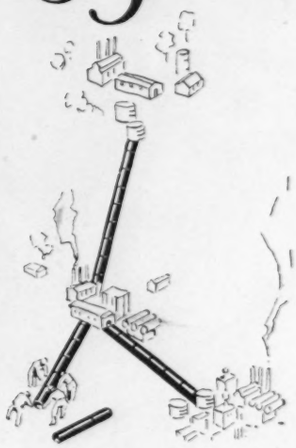
RELIANCE MANUFACTURING COMPANY **Alhambra, California**

HOPE SERVICE to the DIXIE GULF GAS CO.



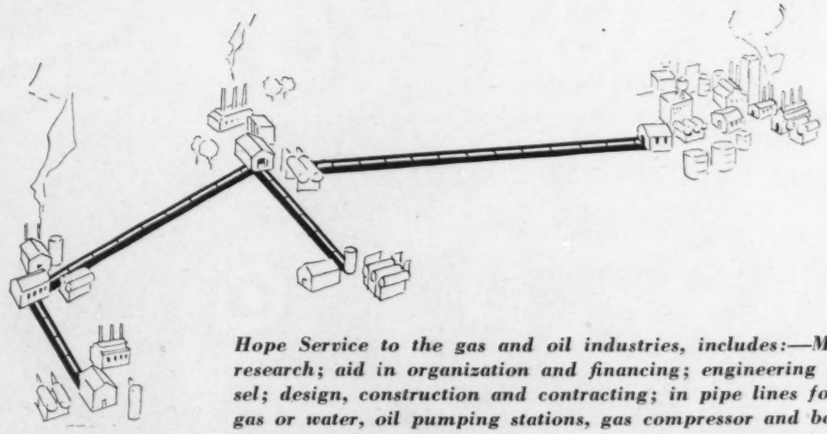


Interior of Waskom Station of Dixie Gulf Gas Co., showing the 28 Hope Vertical Gas Compressors and the three Hope Vertical Engine-Generator units supplying auxiliary power.



In the Dixie Gulf Gas operation—as in a hundred previous construction contracts in the gas and oil fields—Hope resources and experience proved equal to seemingly impossible demands. Unified responsibility for every detail, placed with an organization of proved reliability and resourcefulness, guaranteed success before work began. Completion as per schedule was assured..

To design, equip and put in operation, **in 10 weeks,** a plant of fourteen 160 H. P. Compressors, did not overtax the Hope organization. And to complete, **in 94 days,** a 310-mile line of 22, 18, 16 and 12 inch pipe, was "all in the day's work" for the seasoned Hope construction force. More than 20 years' experience has given the Hope Company "the habit of succeeding" regardless of obstacles.



Hope Service to the gas and oil industries, includes:—Market research; aid in organization and financing; engineering counsel; design, construction and contracting; in pipe lines for oil, gas or water, oil pumping stations, gas compressor and booster plants, gasoline recovery systems, city and inter-city gas mains.

ENGINEERS
CONTRACTORS

HOPE
ENGINEERING AND SUPPLY
COMPANY

DESIGNERS
MANUFACTURERS

MOUNT VERNON, OHIO, U.S.A.
NEW YORK, N.Y. DALLAS, TEX. TULSA, OKLA. CASPER, WYO.

Southern California Gas Co. Line at Colton, Calif.

Positive *Protection* for Pipe Lines *against Electrolysis and Rust!*

While no such severe conditions are likely to be encountered in the field, McEverlast Protective Coating has, under laboratory test, withstood 36 days immersion in a 5% salt solution with a 6 volt, 30 ampere current, without passage of current.

The specimens were then placed in the worst alkaline corrosive soil obtainable, which was moistened. After 46 days of this the test was discontinued. No current had passed—the electrolysis resisting coating held intact.

Applied Cold

Being applied cold, accidents are minimized—smaller painting crews required.

Used by Large Pipe Line Companies

Among the present large users of this coating in different forms are

Southern California Gas Company
Shell Company of California
Pan-American Petroleum Co.
Sun Oil Company
California Petroleum Co.
General Petroleum Co.
California Eastern Oil Co.
Western Oil and Refining Co.
Chanslor-Canfield Midway Co.
Union Pacific Railway Co.
Hercules Gasoline Co.
City of Los Angeles and 29 other cities in the South.

Write or call at our booth for booklet and complete information.

Shell Oil Company Line near Signal Hill, Long Beach, Calif.

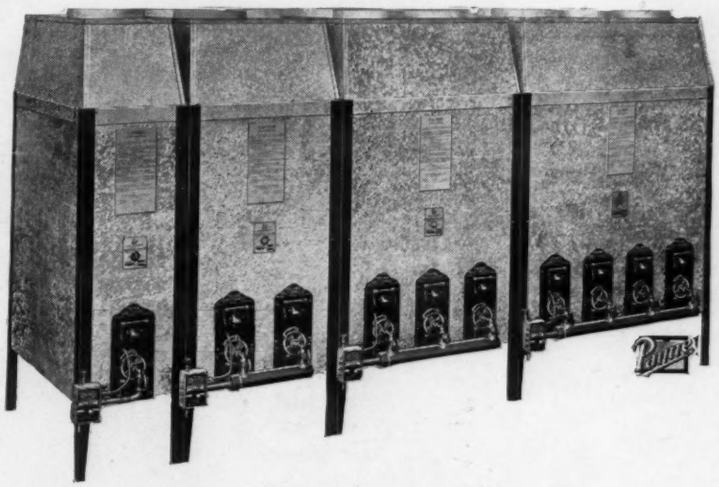
Everlasting Paint & Sales Co.

1110 Board of Trade Bldg.
Los Angeles, Calif.

See Our Exhibit Booth 602

J. M. PAGE, Representative
Texas and Oklahoma
Hotel Austin Austin, Texas

BOOTH 141 - - - DALLAS, TEXAS - - MAY 7TH TO 10TH



All Payne Unit Furnaces Are Approved by A.G.A. Laboratory

Protect your client as well as yourself by installing or recommending Payne Unit Furnaces.

The Complete Payne line of Unit Furnaces has been approved by the American Gas Association Laboratory for efficieny, safety and durability.

A properly installed Payne heating system will last indefinitely—giving dependable, satisfactory service year after year.

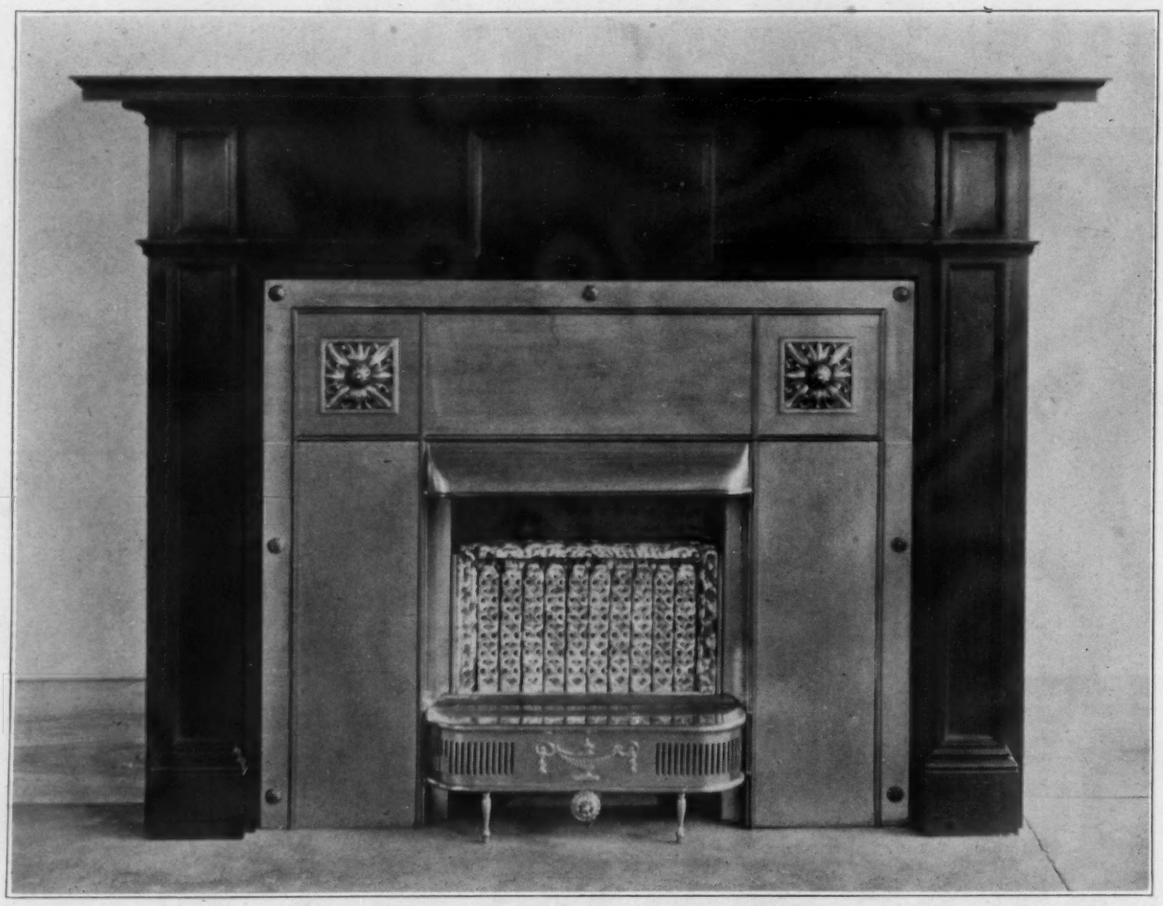
MORE THAN 40,000 Payne Furnaces Giving Complete Satisfaction

The many advantages of the Payne (system) are immediately apparent to prospective purchasers.

If you are in attendance at the Natural Gas Convention, visit our Booth, No. 141, and see for yourself the many superior features of the Payne Furnace.

PAYNE FURNACE & SUPPLY CO. INC.

Main Office, 338 Foothill Road, Beverly Hills, Calif.
Branch: 3810 Broadway, Oakland, Calif.
Branch: 115 E. Union St., Pasadena, Calif.



Every Construction Permit Means a Market

Homes; apartments; hotels; clubs—all of them need fireplaces. Every construction permit issued for these classes means a new prospect for the Humphrey Radiantfire-Mantel, which is a fireplace of handsome appearance, and a Humphrey Radiantfire heating unit, all in one low-priced product.

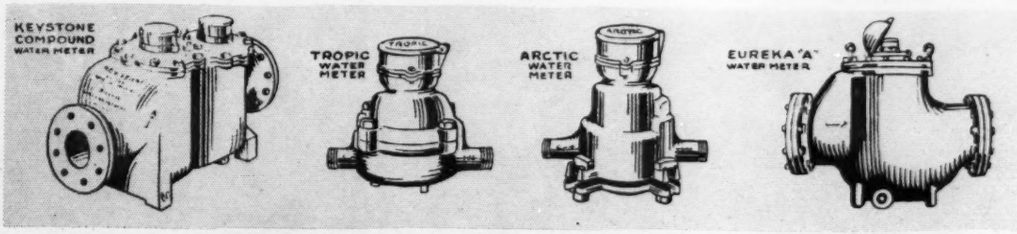
Because it costs much less than any kind of ordinary fireplace construction, the market opened up by this new Humphrey product is without limit. Constructed and designed up to Humphrey's high standards; available in two types of finish; easily installed, at small cost.

Prices: No. 500—Finish, 3 coats flat white, list price.....$118.00
No. 501—Finish, mahogany, list price $125.00
F. O. B. San Francisco

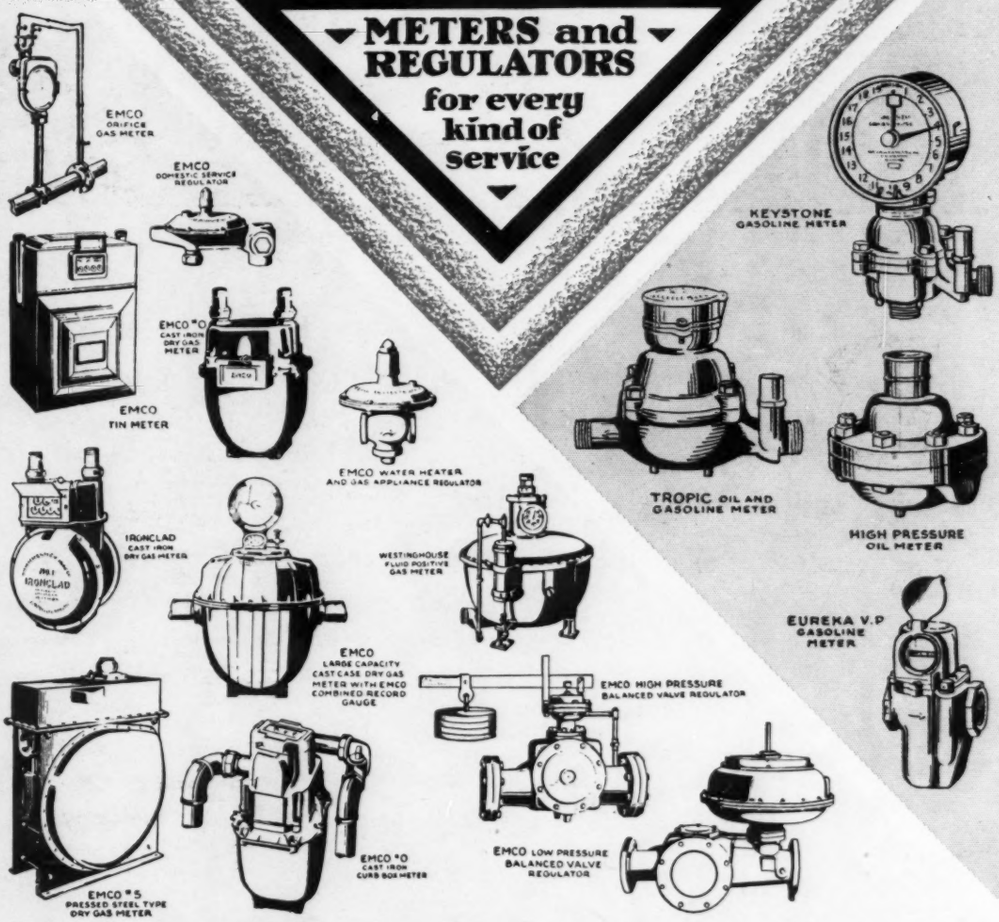
The
HUMPHREY
Radiantfire
TRADE MARK REG. U.S. PAT. OFF.
MANTEL

Manufactured by
General Gas Light Co.
Kalamazoo, Mich.

Pacific Coast Manager
C. B. Babcock
135 Bluxome St.,
San Francisco



METERS and REGULATORS for every kind of service


EMCO ORIFICE GAS METER
EMCO DOMESTIC SERVICE REGULATOR
EMCO "O" CAST IRON DRY GAS METER
EMCO TIN METER
EMCO WATER HEATER AND GAS APPLIANCE REGULATOR
KEYSTONE GASOLINE METER
TROPIC OIL AND GASOLINE METER
HIGH PRESSURE OIL METER
IRONCLAD CAST IRON DRY GAS METER
WESTINGHOUSE FLUID POSITIVE GAS METER
EUREKA V.P GASOLINE METER
EMCO LARGE CAPACITY CAST CASE DRY GAS METER WITH EMCO COMBINED RECORD GAUGE
EMCO HIGH PRESSURE BALANCED VALVE REGULATOR
EMCO "O" CAST IRON CURB BOX METER
EMCO LOW PRESSURE BALANCED VALVE REGULATOR
EMCO "S" PRESSED STEEL TYPE DRY GAS METER

PITTSBURGH EQUITABLE METER COMPANY

MAIN OFFICE AND WORKS

PITTSBURGH, PA.

BRANCH OFFICES

NEW YORK CHICAGO COLUMBIA, S.C.

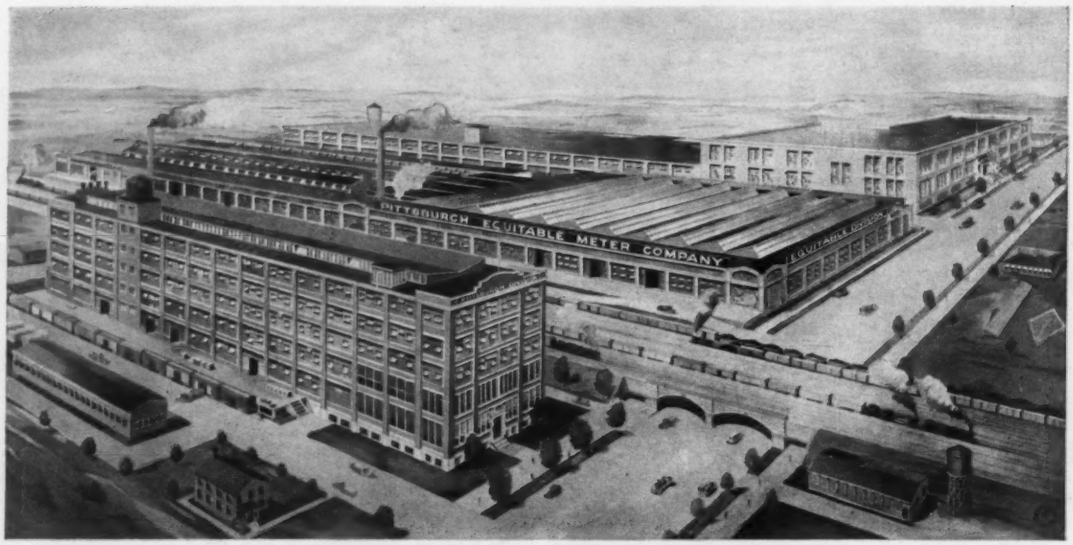
LOS ANGELES DALLAS TULSA

SALT LAKE CITY

KANSAS CITY

SEATTLE

ORMISTON-DOYLE COMPANY, PITTSBURGH



Factories and General Offices, Pittsburgh, Pa.

DURING the past two years in which the gas industry has had a normal growth, the Pittsburgh Equitable Meter Company has more than doubled its business. While this is a sign of the increased satisfaction with our product, instead of making us content with our progress, it has made us more anxious to serve the gas industry in every possible way.

We are devoting a large part of our income to scientific research work in our Chemical and Physical Laboratories and in our Engineering Department. We believe we have the best technical equipment for testing and developing better devices for gas measurement and gas pressure regulation.

Our resources are at the disposal of the gas industry. A number of new devices are in the process of perfection which will afford definite illustrations of progress in the branch of industrial science to which this company has devoted its efforts.

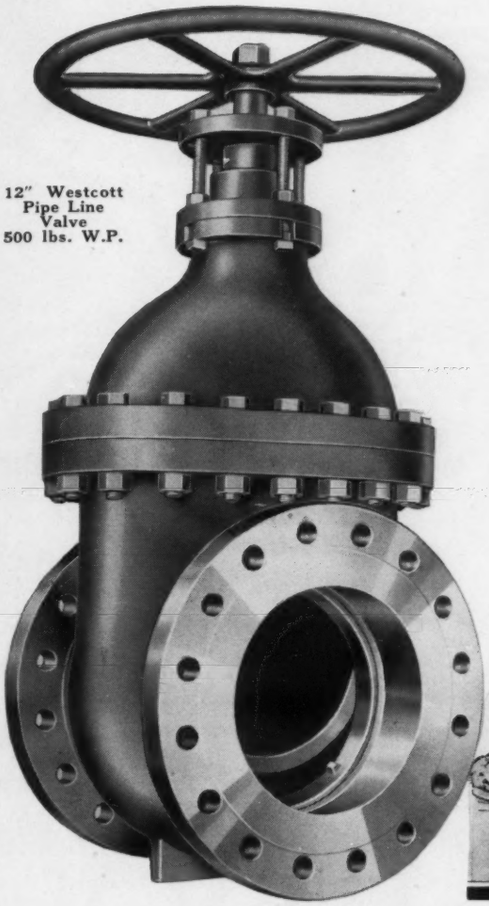
PITTSBURGH EQUITABLE METER COMPANY

MAIN OFFICE AND WORKS

PITTSBURGH, PA.

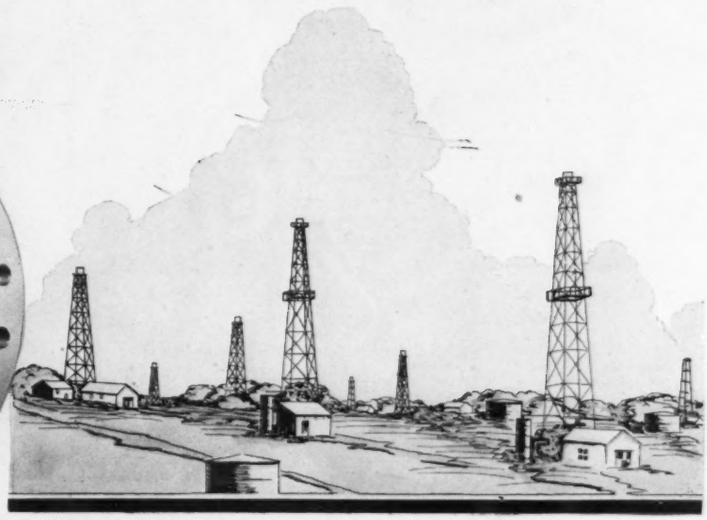
BRANCH OFFICES

NEW YORK CHICAGO COLUMBIA, S.C. LOS ANGELES DALLAS
TULSA SEATTLE KANSAS CITY SALT LAKE CITY



12" Westcott Pipe Line Valve 500 lbs. W.P.

WESTCOTT HIGH PRESSURE VALVES



"If CONTINENTAL Sells it, There is No Better"

First Choice for Natural Gas Pipe Lines

There is a logical reason why WESTCOTT Valves have earned world-wide preference among oil and gas operators. That reason is that WESTCOTT specializes **exclusively** in the manufacture of valves for oil and gas service. The special requirements for this work have been exhaustively studied over many years by Westcott engineers, and WESTCOTT Valves represent today equipment that has been brought by painstaking care to a very high degree of perfection.

Among the merits of these valves are great over-strength—insured by testing each valve under hydraulic pressure—exceptional durability, resulting from the high grade materials used—maximum capacity due to unobstructed runways—strict interchangeability of parts.

Sizes and styles are offered for every gas industry requirement.

THE CONTINENTAL SUPPLY COMPANY

General Offices: St. Louis

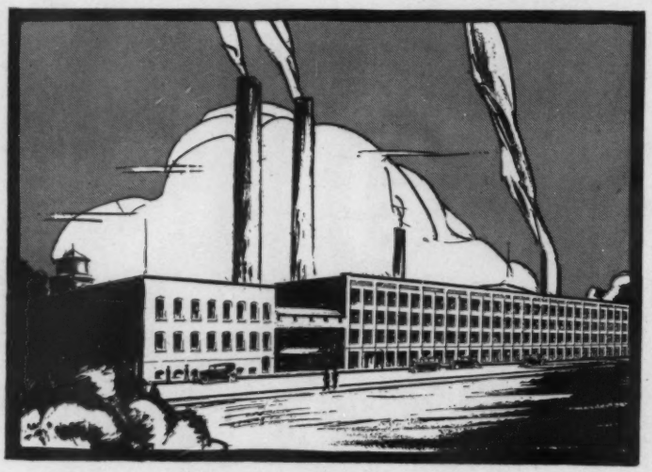
Export Office: 74 Trinity Court, New York **London Office: 316-317 Dashwood House, Old Broad St., E. C. 2**

THE CONTINENTAL SUPPLY COMPANY, Ltd.,

69 Thomas Block, Calgary, Alberta, Canada

CONTINENTAL

From Factory...



FROM the great factories of the Metric Metal Works of the American Meter Company, from G. M. Davis Regulator Company, Chaplin Fulton Manufacturing Company, Meriam Company, and from D. McDonald & Company, Bristol Company, Taylor Instrument Companies, Crosby Steam Gage & Valve Company, and the Reliance Manufactturing Company, etc.—all of whom we represent—comes dependable and efficient gas industry equipment for our customers.

To Consumer

OUR engineers are at your service, should you desire their counsel and data in choosing equipment for your requirements. This service is rendered entirely without cost to you.

Westcott & Greis, Inc.

Los Angeles — Tulsa — Dallas

Los Angeles Office, 1945 Santa Fe Ave.

Phone TRinity 8497

WESTCOT

S A L E S &

From Field...

OUR line of conservation and safety, and measurement and control, gas industry equipment is complete—from oil well to distributing plant. It includes orifice meters, valve specialties, gas and steam regulating valves, gas regulators, laboratory and testing apparatus, gas plant specialties, recording pressure gauges, "Tycos" instruments, "house type" regulators, etc. Special or standard, if it's in our line, we can furnish it. Write, wire or phone us for complete information.

To Distributor

WE MAINTAIN large and complete stocks so that invariably immediate shipment can be made. We also maintain a service department to keep the equipment we distribute at its highest efficiency.

Westcott & Greis, Inc.

Los Angeles — Tulsa — Dallas

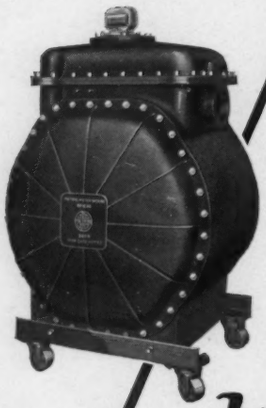
Los Angeles Office, 1945 Santa Fe Ave.
Phone TRinity 8497

T & GREIS

SERVICE

IRONCASE

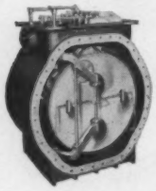
Meets the Greater needs of gas Measurement with New sizes of large capacity Meters

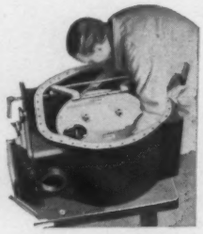


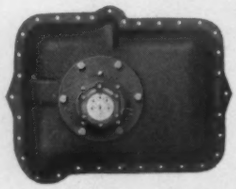
For Industrial and Drilling Wells, Large Capacity, High Pressure, Low Pressure and Vacuum Service.

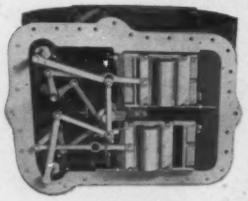
In Which

METRIC METERS









Capacity is increased with no increase in weight. Capacity is increased with no increase in number of revolutions per foot of gas measured.

Slide valves and tin meter type diaphragms are employed on essentially the same principle as in tin meters.

Timkin bearings are used on crank step, crank stand and two flag steps.

Alemite lubrication is provided and meters may be lubricated from outside while meter is in operation.

Lighter valve covers which eliminate friction and squeaks, without sacrifice of wearing qualities, are used.

A great improvement over 100 B and 200 B Ironcase Meters which they displace, these new sizes represent an important achievement in the history of Metric Metal Works and of the entire gas industry.

All High Pressure Ironcase Meters are badged at maximum working pressure (not test pressure). This means that for safety they are actually tested to a pressure twice as high as they are badged.

The new Bulletin No. 300-B will be sent upon request.

Pacific Meter Works of the American Meter Co., Inc.
San Francisco Los Angeles

Dallas

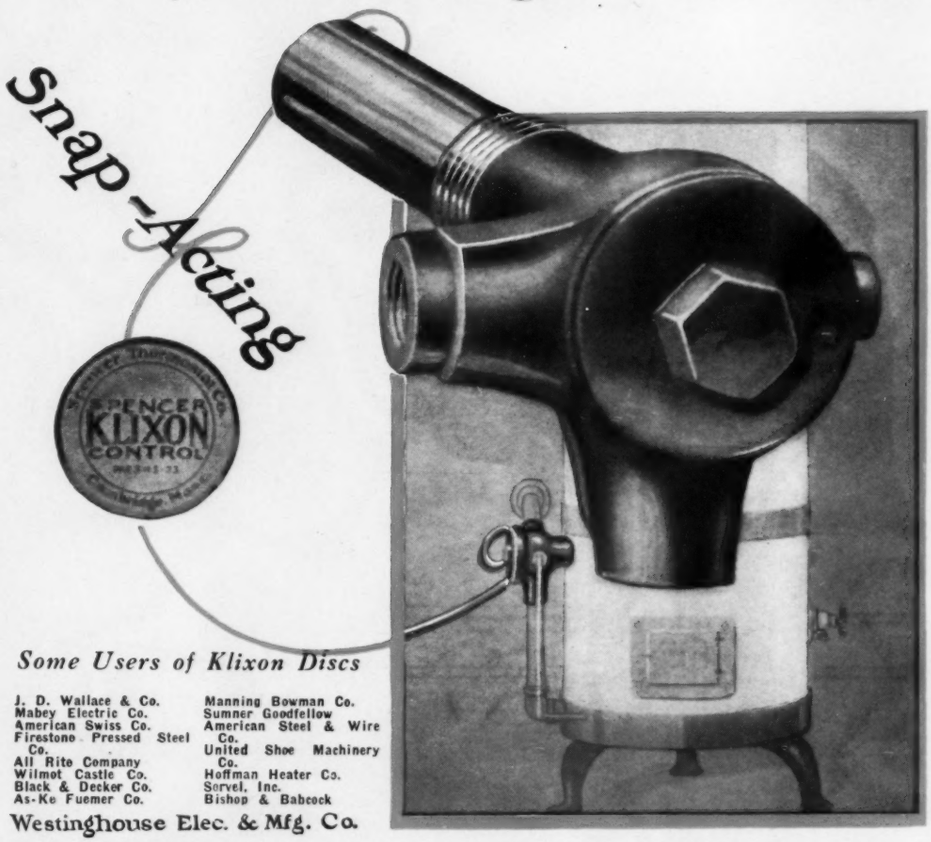
Westcott & Greis Sales Service
Tulsa Los Angeles

METRIC METAL WORKS

of the American Meter Company-Inc.

ERIE - PENNSYLVANIA - U-S-A

Put this $1,000,000 idea on your storage water heaters!



Some Users of Klixon Discs

J. D. Wallace & Co.
Mabey Electric Co.
American Swiss Co.
Firestone Pressed Steel Co.
All Rite Company
Wilmot Castle Co.
Black & Decker Co.
As-Ke Fuemer Co.
Manning Bowman Co.
Sumner Goodfellow
American Steel & Wire Co.
United Shoe Machinery Co.
Hoffman Heater Co.
Servel, Inc.
Bishop & Babcock

Westinghouse Elec. & Mfg. Co.

KLIXON IMMERSION TYPE THERMOSTAT

As a result of constant effort, the Spencer KLIXON Control was developed to a point where the Westinghouse Electric & Manufacturing Company bought the license for electrical application. (This license is for the U. S. only.) The Westinghouse Company calls the KLIXON "The Million Dollar Thermostat."

You can obtain this snap acting, absolutely accurate and long wearing Thermostat for your storage water heater.

The unique construction is simplicity itself. No toggles, cams, levers or diaphragms are used. There is therefore nothing to give trouble—nothing to require "service."

The Spencer Disc does it all—in .00016 of a second.

Let us discuss your problems with you. Our research facilities are always available without any obligation on your part.

Now is the time to consider the KLIXON for the coming year! You should see the new KLIXON Safety Pilot in operation.

Visit Booth #530

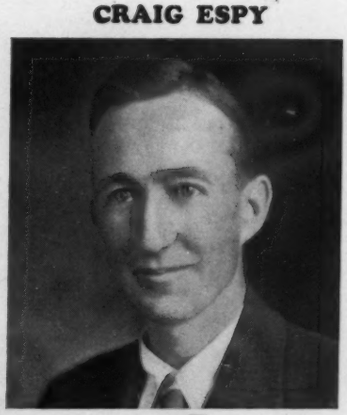
Spencer Thermostat Company

Kendall Square Bldg., Cambridge, Mass.

"The Million Dollar Thermostat"

W. G. RUSSELL

JAY JENKINS


CRAIG ESPY

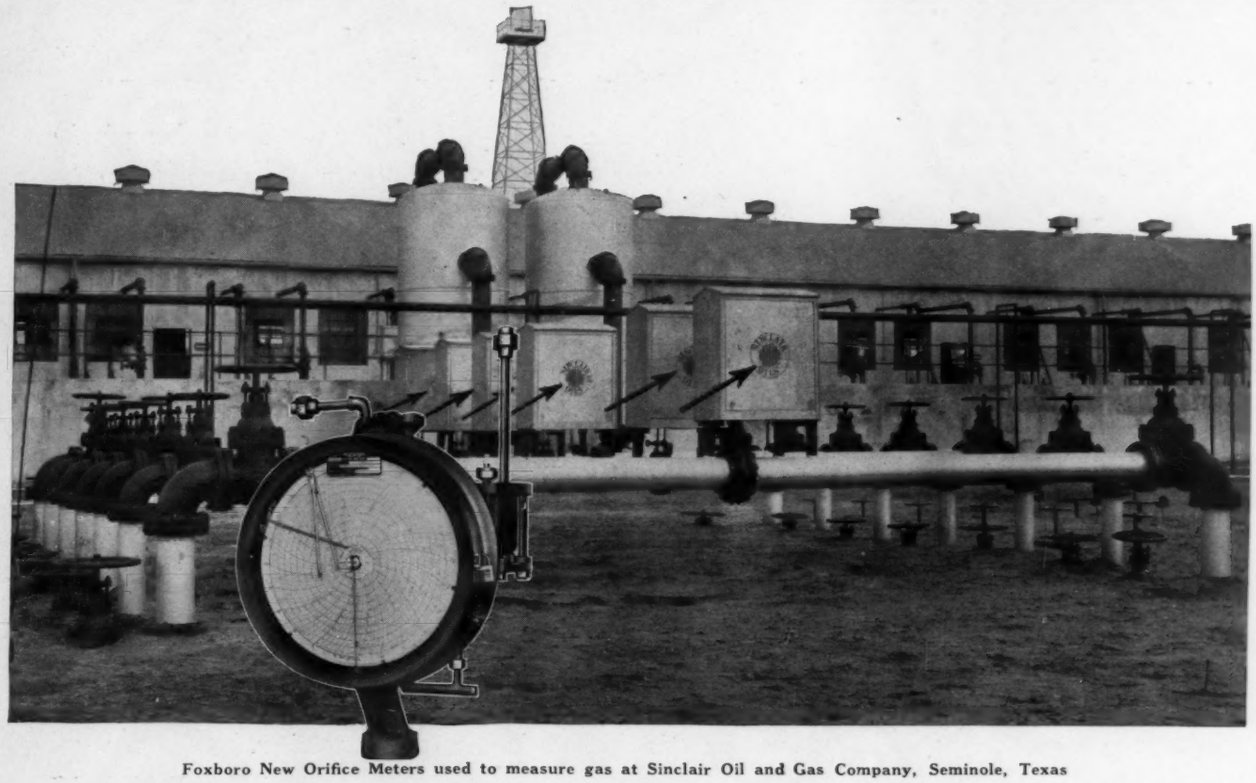
At

Booth 304

..We'll be there to greet you

WESTERN GAS

Supreme in the West



Foxboro New Orifice Meters used to measure gas at Sinclair Oil and Gas Company, Seminole, Texas

See How Foxboro Operates Under Actual Working Conditions

When you visit the Natural Gas Convention at Dallas, May 7th to 10th, don't fail to see our exhibit in Booths 424 and 426. There will be a complete exhibit of Automatic Controllers for gas distribution problems including

Demand Pressure Controller which maintains the minimum pressure according to the load demand;

Time Pressure Controller which packs the line in anticipation of the load;

Differential Limit Controller which makes a Duplex Meter Setting positive in operation;

Pressure Controller which reduces and positively holds the reduced pressure regardless of variation in up-stream pressure and load.

New Foxboro Orifice Meter which has no inherent error.

There will be a demonstration set-up so arranged that **the full floating action** of a controlled valve can be observed under operating conditions.

All Foxboro Instruments have been thoroughly tested in the field and are now in use by leading gas companies everywhere. You can now buy or sell gas from records that are accurate, not approximate.

THE FOXBORO COMPANY
Neponset Avenue, Foxboro, Mass., U. S. A.

WESTERN OFFICES
Los Angeles, 443 San Pedro St. San Francisco, 461 Market St. Portland, Ore., 816 Lewis Bldg.

New York Rochester, N. Y. Chicago Philadelphia Pittsburgh Detroit Cleveland Boston Atlanta Tulsa

FOXBORO
REG. U. S. PAT. OFF.
THE COMPASS OF INDUSTRY

Instruments for Controlling, Recording and Indicating Temperature, Flow, Humidity, Pressure

The Houston Pipe Line Company

Extends a Cordial Welcome to the Delegates Attending the Annual Convention of the Natural Gas Division of the American Gas Association at Dallas, Texas

To better visualize the major part being played by natural gas in the rapid industrial development in South Texas, the Houston Pipe Line Company, transporters and industrial distributors of natural gas, and the Houston Natural Gas Company, local distributors have had prepared a 2000 foot industrial and historical film depicting in a graphic and concise manner the past three years accomplishments of these Companies.

In this picture scenes are laid in the most historical parts of Texas through which course the six hundred and fifty mile high pressure gas pipe line system of these Companies, utilizing compressor stations having a combined horsepower of twelve thousand and through which lines in 1927, the second full year of operations, there was delivered thirty billion cubic feet of gas.

Delivering nearly one hundred million cubic feet daily and with an ever increasing demand, the Houston Pipe Line Company has already looped its sixteen inch and eighteen inch main line from Edna to Houston, a distance of one hundred miles, and plans in the near future to have its main line system completely looped from the gas fields in Southwest Texas to Houston, a total distance of three hundred miles.

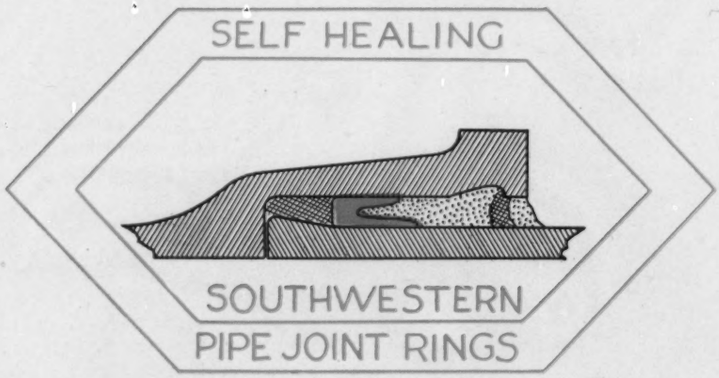
To those gas men who are interested, the Houston Pipe Line Company, upon application, will gladly make this film available for a showing.

Houston Pipe Line Company

PETROLEUM BUILDING
HOUSTON, TEXAS

Make Your Gas Joints Self Healing

Sample Ring for Test Furnished on Request. – No Charge –



SOUTHWESTERN PIPE JOINT & ENGINEERING CO.

1108-1110 Fifth Avenue
BIRMINGHAM, ALABAMA

A Standard Big Gas Engine

At least 90% of the power used on natural gas pipe lines during the past ten years has been Cooper 1000 H. P. engines. This engine has become standard for this service everywhere.

Although the demand for such equipment has always been irregular and never large, the fact that Coopers have been so widely accepted as standard has made it possible to keep their engineering development up to date and selling prices reasonable.

Four outstanding characteristics have resulted in retaining their position of leadership. First, they are accessible—operators like them. They are reliable to the point where many of their operating records seem unbelievable. They can be installed quickly and at a reasonable expense. Their operating costs—fuel, lubricating oil, labor and repairs—are low.

THE C. & G. COOPER COMPANY

Dallas, Texas Mt. Vernon, Ohio Los Angeles, Calif. Tulsa, Okla.

Added Features of the "B" Meter

The improved so-called "Slow Speed" meter has other features

ALMOST important feature in connection with the conservative speed of the "B" meter is the fact that while the meter's rated capacity under 5-10 inch loss is ample for normal working conditions, it is so constructed that it can take an overload of 50 per cent greater than its rated capacity. Thus the occasional peak load is provided for.

THIS extraordinary overload up to 50 per cent is taken care of with a maximum total loss not exceeding 1 inch. In our careful calculation of valve areas, channel areas and other construction details, we have maintained as closely as possible uniformity in capacity and in actual speed rate between the different sizes of meters.

Pacific Meter Works

of the
American Meter Company, Inc.
Northwestern Representative

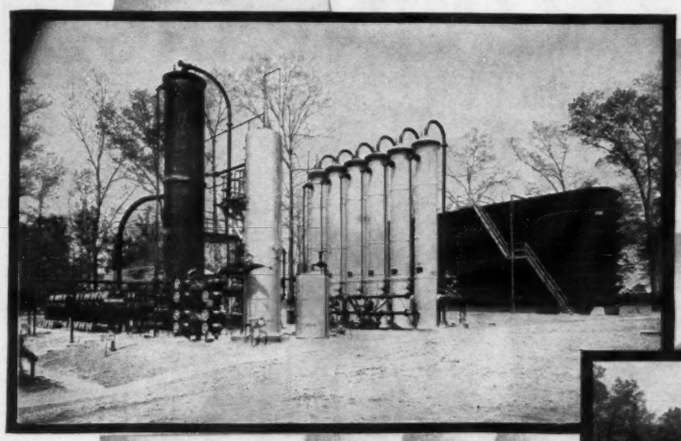
SAN FRANCISCO
495 Eleventh St.

PORTLAND
Northwestern Gas and Electric Equipment Co.

LOS ANGELES
2118 Atlantic St.

A RECORD

IN GASOLINE PLANT CONSTRUCTION



47 DAYS AFTER APPROVAL OF ENGINEERING DETAILS THIS HIGH PRESSURE BRAUN GASOLINE PLANT ON GAS LINE IN TEXAS, WAS IN OPERATION.

DESIGNED, MANUFACTURED AND INSTALLED BY

BRAUN

C. F. BRAUN & CO.

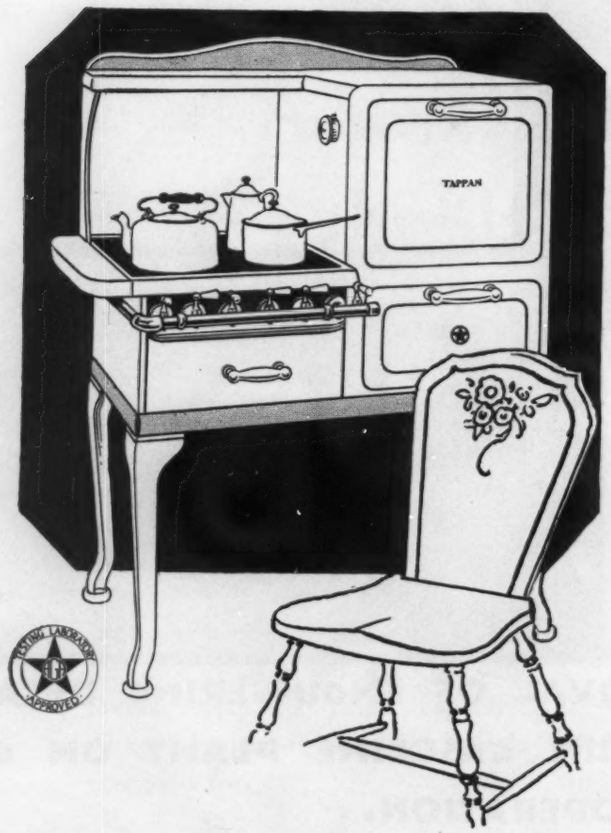
MANUFACTURING MECHANICAL ENGINEERS

ALHAMBRA CALIFORNIA

TULSA DALLAS NEW YORK

BRAUN

Announcing—the new TINTED TAPPAN GAS RANGE



Color

—introduced in a form that will appeal to the gas appliance merchandiser as well as the housewife.

WE ANNOUNCE: A new line of *Tinted* Tappan Gas Ranges designed to meet two important requirements:

1. Practicability to the merchant;
2. Utmost appeal to the housewife.

Months of study and experiment have been spent in developing these beautiful color ranges — months of intensive effort during which the services of a master decorator have been employed.

These new Tappan Ranges are trimmed in a choice of tasteful tints — shades that are soft and harmonious — delicate hues that "wear well" and are in perfect keeping with any surroundings.

Note that color is employed only on carefully chosen parts of the trim. Each color piece is readily interchangeable, making it possible for the merchant to satisfy every taste from a moderate stock.

There is no denying the tremendous appeal of color in the kitchen today. Enamelware in colors—tables, chairs, floors, curtains. *And now the new Tinted Tappan Gas Ranges, affording the gas appliance merchandiser a product that will awaken desire for a new modern range in the home!*

We shall be glad to send you full information about the Tinted Tappan Gas Ranges and our effective merchandising plans. Write today.

THE TAPPAN STOVE COMPANY, Mansfield, Ohio

665 Howard Street, San Francisco, Calif.

Angel food cakes! easy to make

When grandmother made angel food cakes the recipes of her day were inaccurate. It took years to know her oven.

But today, when you accurately measure and mix ingredients you believe your cakes should always be good.

They will be, unless you're guessing at the oven temperature which is the chief cause of rubbery angel food cakes. They must be baked at 325 degrees.

An Oven Temperature Control

All the modern gas ranges have the Oven Temperature Control. It keeps the oven at exactly the temperature for which it is set. You place the angel food cake in the oven, set the Control for 325 degrees and leave the kitchen for an hour. The monotony of watching the baking vanishes. Meats, pies, and even a whole meal can also be baked with the same ease and freedom.

See the modern gas ranges with the Oven Temperature Control.

PACIFIC GAS AND ELECTRIC COMPANY

P·G·and E·

Owned · Operated · Managed by Californians

Reproduction of a 3 column 8 inch newspaper advertisement.

When you want to sell a quality gas range--

tell women the real reason for baking success

The real reason for baking success is not the quality of flour, the kind of shortening or the brand of canned milk. It's the oven. Baking must be done in a good oven. Like the ones on the better gas ranges. But more important still, baking must be done in the proper oven temperature. Ask any home-economist.

Women know how to measure and mix ingredients; manufacturers make good flour and other things that go into the making of food.

But the great story partly told is: "Proper Oven Temperature Makes Perfect Baking Easy." The best way to get the right oven temperature is with the Oven Temperature Control—a device on the better gas ranges.

That's the idea behind our newspaper advertisements this month, helping dealers sell quality merchandise.

PACIFIC GAS AND ELECTRIC COMPANY

P·G·and E·

Owned · Operated · Managed
by Californians

206

THEOPHILE, of the Sherry-Netherland, tells why he likes this type of range

THEOPHILE is a master of his art. That is why he was chosen chef of the Sherry-Netherland, society's newest New York gathering place. The ranges in his kitchen were made by the makers of Smoothtop. So were the ranges used by 80 per cent of the other leading chefs.

Smoothtop is nothing more nor less than a household model of this favorite range of the chefs. Smoothtop has the same coal-range top and the same breathing burner. It gives every modern improvement in oven-cookery and adds hotel-range improvements in top-cookery. And its straight console design creates a modern streamline beauty.

THESE ARE THEOPHILE'S OWN WORDS:

"On Smoothtop, I can use the same methods and get the same results as on my hotel ranges.

* * *

"See . . . here. Only one burner is lighted. The flame makes a hot-spot on the solid, coal-range top. Here I bring vessels to a quick boil.

* * *

"See . . . also. This broad, smooth surface. It spreads the heat. So I push the soup and vegetables back for gentle boiling and simmering.

* * *

"Here they come to delicate perfection. But I must have this coal-range top."

* * *

(PLEASE NOTE THE LITTLE WHEEL WHICH IS SMOOTHTOP'S MODERN OVEN-HEAT CONTROL)

* * *

FAMOUS METHODS OF FAMOUS CHEFS . . . . . *FREE*

Their own pet methods! What they like in gas ranges! Smoothtop models. All given in the most interesting cookery booklet of the year. Free. Please sign and send the coupon.

STANDARD GAS EQUIPMENT CORPORATION
18 EAST 41st STREET, NEW YORK
Please send "Famous Chefs" booklet to
NAME .....
ADDRESS .....
..... 57-61st-2
Do you wish name of dealer? ☐ Yes ☐ No (Please check)

STANDARD GAS EQUIPMENT CORP., MAKERS OF VULCAN HOTEL RANGES, ORIOLE, ACORN AND

Smoothtop
REG U.S. PAT OFF.
GAS RANGE

April 1928 Good Housekeeping

1,500,000

women are reading this famous chef's recommendation of the

Smoothtop
REG U.S. PAT OFF.

Gas Range

OF the more than 1,500,000 women who are reading this advertisement in Good Housekeeping Magazine, hundreds and perhaps thousands are in your own city.

Thousands of women have written in for the booklet and, what is more important, have asked where they could buy a Smoothtop.

Dealers and gas companies have written enthusiastic letters telling of sales made as a result of names sent them. The interest developed by this campaign in Good Housekeeping has been amazing, even to us.

Let us send you reprints of the advertisement, together with a copy of our new book, "Famous Methods of Famous Chefs," in which famous chefs tell why they recommend **Smoothtop.** The wife will be interested in the many new and unusual recipes. Drop us a line today.

Northwest Gas and Electric Equipment Co.

Pacific Coast Distributors, Standard Gas Equipment Corp.

Public Service Bldg.
Portland, Ore.

2nd & Brannan Sts.,
San Francisco, Calif.

164 So. Central Ave.
Los Angeles, Calif.

Each prospect has a dual nature ~ ~ *appeal to the right one!*

YOU can talk in terms of bungalow aprons or evening gowns. You can refer to morning chores or evening gaieties. You can set up a background of the kitchen or the ball room. For Hotzone hot water service is as important to home beauty treatments as it is to kitchen cleanliness.

Bear in mind that every manufacturer of facial soaps and shampoos—and every woman's favorite beauty specialist—advocates the use of warm water at unearthly hours as the first step to beauty.

By the same token use the beauty appeal as the first and surest step to a Hotzone sale.

If you want to convince yourself just where the money is spent most freely, pause at the Housefurnishings Department and then at the cosmetic counter of your favorite store.

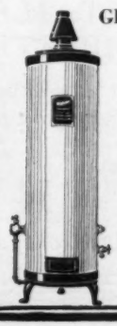
Welsbach has made the Hotzone more than a household necessity—it has made this wonder water heater a *beauty* necessity, also. Don't miss this point in your sales approach. Remember, the hand-mirror is mightier than the scrubbing-brush as a buying urge.

Welsbach has prepared a series of advertisements that commercial managers can use to back up their salesmen properly. Information and proofs will be sent on request. **Welsbach Company, San Francisco Office, 863-65 Mission St.**

Gloucester City, N. J. Offices in Principal Cities.

Member of American Gas Association
Member of Pacific Gas Association

Welsbach



HOTZONE

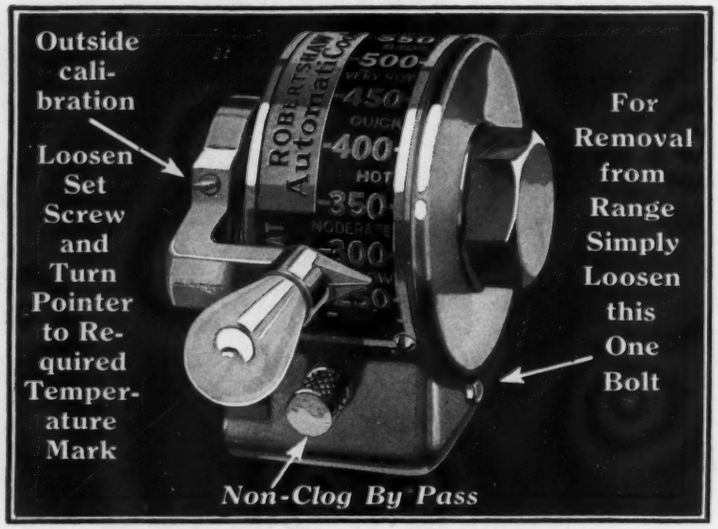
SELF ACTION GAS WATER HEATER

You Should Get Acquainted with the Latest Features

of the

"B" Type

ROBERTSHAW AutomatiCook


Outside calibration
Loosen Set Screw and Turn Pointer to Required Temperature Mark
For Removal from Range Simply Loosen this One Bolt
Non-Clog By Pass

Outside Calibration (*a comparatively late improvement*) Takes just a few seconds to change the temperature setting if required, by means of a convenient set-screw on the temperature pointer. Merely loosen the set-screw, move the pointer to the proper temperature mark on the dial, and then tighten the set-screw.

Quick Removal (*a feature introduced about a year ago*) Should the "B" Type AutomatiCook become damaged for any reason, necessitating replacement, it can be removed without disconnecting the range or disturbing the linings or the piping. Requires no mechanical servicing or repairs on the job. Simply loosen one bolt, replace the Thermostat with a spare and tighten the bolt. The job can be done in less than a minute's time.

Non Clog By-Pass Pilot (*Successfully used for more than a year*) Will not clog nor bind. Always moves freely and maintains its adjustment. Eliminates servicing, adjusted by turning either to the right or left.

Another Improvement. The AutomatiCook is now being equipped with a Raised Non-Corrosive Valve Seat which will resist the corrosive action of gas, eliminating any possible trouble from this source.

Gas ranges will soon be coming through to you with AutomatiCooks having all these advantages!

LEARN THE DETAILS IN ADVANCE
WRITE FOR COMPLETE INFORMATION

If you will also send us the names of all employes handling, selling or installing Gas Ranges, we will be pleased to send them descriptive literature covering these features.

ROBERTSHAW THERMOSTAT CO.

Youngwood, Penna.

WESTERN GAS

307 Thomas Building,
Dallas, Texas
Phone 2-8708

447 Sutter Street
San Francisco, Calif.
Phone GArfield 2772

Publication Office, 124 West Fourth Street
Los Angeles, Calif. Telephone TUcker 8982

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CRAIG ESPY
Mid-Continent Manager

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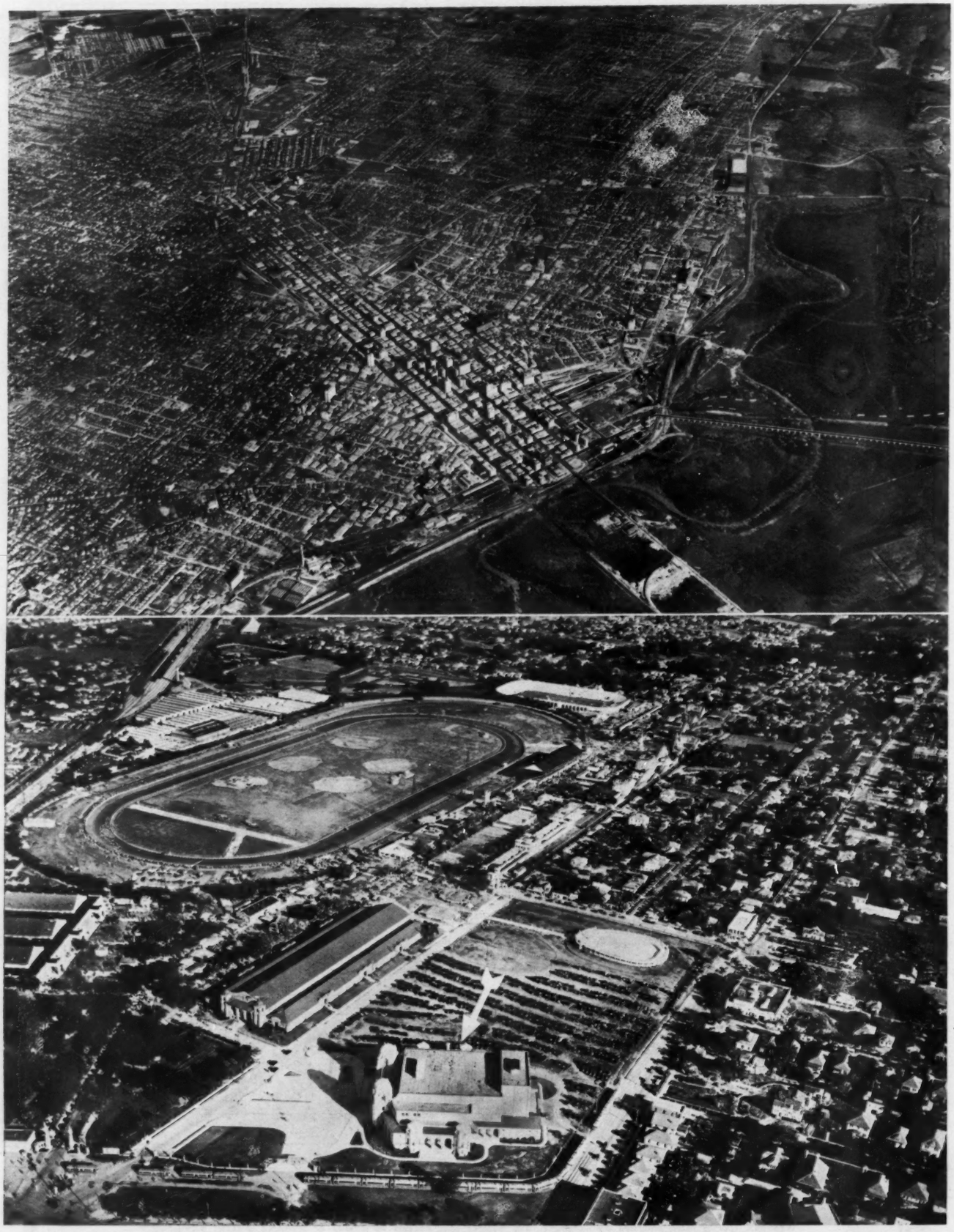


SEEN FROM THE AIR, ABOVE DALLAS, TEXAS. UPPER: CENTRAL AREA OF THE CITY. LOWER: VIEW OF CONVENTION LOCALE—ARROW INDICATES FAIR PARK AUDITORIUM WHERE SESSIONS WILL BE HELD.—PHOTOS BY FAIRCHILD AERIAL SURVEY, INC., DALLAS

WESTERN GAS

A Monthly Journal of the Gas, Gas Appliance and Natural Gasoline Industries in *Western America*

SAN FRANCISCO **LOS ANGELES** **DALLAS**

The Stage Is Set *at* Dallas *for* Visiting Gas Men

IN asking the natural gas men of the United States and Canada to come to Dallas for their annual convention, May 7 to 10, we feel that we are not only honoring ourselves but we are giving everyone in the industry an opportunity to benefit himself and his company.

The arrangements and the co-operation of every committee and every individual connected with the convention indicate that we shall have as fine a convention as the industry has ever produced.

Oscar H. Fogg, president of the American Gas Assocation, is enthusiastic regarding the propects. Says the A.G.A. head:

"Just as the past year has been one of the most important the organized gas industry of America has ever witnessed, so will the coming Dallas convention be the most outstanding ever held. I say this advisedly and in the face of records established by splendid conventions held in the past years."

Dallas is singularly well equipped to handle a great convention such as the Natural Gas Department will undoubtedly hold. For the regular sessions of the convention there is the Texas State Fair Auditorium, one of the finest in the Southwest. This auditorium seats about 5,000 persons and is equipped with loud speakers, telephone facilities, committee rooms, press rooms, and rest rooms.

Only a few yards away from the auditorium the manufacturers' building, one of the largest exhibit buildings in the Southwest, is being prepared for the great gas appliance and machinery exhibit.

By HENRY C. MORRIS

Vice-President and General Manager Dallas Gas Company

The Fair Grounds is located about a mile from the center of Dallas. Transportation to the grounds is excellent, the street cars running every minute or two.

Henry C. Morris

ADOLPHUS CITY HEADQUARTERS

Convention headquarters in the city will be at the Adolphus Hotel. There the committees and sub-committees will hold their meetings and the elaborate entertainment program planned for the gas men will be given.

The Adolphus is perhaps the largest and most modern in equipment of any hotel in the Southwest. It has more than 800 guest rooms in its 23 stories, and it is altogether a gas hotel. Gas is used to make the power that supplies its electricity; it is used for cooking, for cooling, for heating, for manufacturing ice, for pumping water into the rooms.

In the Adolphus the first preliminary meetings of the convention will be held, including sessions of the main technical and research committees and subcommittees and the managing and advisory committee, Natural Gas Department. The dinner of the managing and advisory committees will be held on Monday evening, May 7, the first day of the convention, in this hotel.

The opening of the speakers program will take place on Tuesday morning in the auditorium, Texas Fair Grounds. N. C. McGowen of Shreveport, chairman of the Department, will preside throughout the meetings.

Dean Robert S. Chalmers of Dallas St. Matthew's Cathedral will give the invocation.

Dallas will be represented by her mayor, R. E. Burt, in an address of welcome to be answered by Christy Payne, Hope Natural Gas, Pittsburgh.

In the annual address of the chairman, N. C. McGowen will outline the activities of the Natural Gas Department during the past remarkably prosperous year and will indicate the line of march of the organization. A committee will then be appointed on the president's address by S. W. Meals, Pittsburgh, vice-president.

Among the scheduled addresses are those of O. H. Fogg, president of the American Gas Association, and Alexander Forward, managing director of the A. G. A. Mr. Forward will be on the Tuesday, May 8, program.

R. M. Conner, director of the American Gas Association Laboratory, will tell of some of this institution's problems and accomplishments in his paper on "Improving the Use of Natural Gas."

"History of Development and problems of the Natural Gas Industry in California" is the title of a paper to be given by Harrison P. George of the

(Continued on Page 74)

New Territory Compassed *in* Swift Outreach *of* Natural Gas Lines

By CRAIG ESPY
Mid-Continent Manager
WESTERN GAS

NO other phase of utlity development can match the current expansion in natural gas transmission. In this development picture the great Southwest appears in the center foreground, showing itself strong in gas resources and in the initiative that has been largely responsible for widening the availability of this ideal fuel.

It is the purpose herein to briefly sketch some of the more important transmission projects which have been brought to completion in 1927 or thus far this year, and to mention a few of the gas line undertakings that are either being definitely projected during 1928 or are regarded as possibilities for future construction.

In several cases where certain of the important recent pipe line enterprises are treated in other articles which appear in this issue, no mention is made of them here.

Natural gas line extension did not confine itself to any one section of the Southwest in 1927. All sections, directly or indirectly, felt the beneficial effects of the capital released in these developments, and the years immediately ahead will witness the industrial reaction of sections to which gas has been made newly available.

NATURAL GAS FOR 175 TOWNS

In Texas and Oklahoma last year 175 towns were added to the already long list of those receiving natural gas, and this list is fast lengthening. El Paso is the only city in Texas which still has manufactured gas, and present indications point toward the laying of natural gas mains to this last section. The El Paso Gas Company's system of 143 miles of gas line, which extends throughout the city and across the border to Juarez and Chil, Mexico, with the coming of natural gas may be confidently expected to undergo a speedy expansion. This system already serves a list of 570 industrial users. Domestic consumers number 11,700.

The natural gas route most talked of in connection with El Paso is a line from the Panhandle fields through the Pecos Valley of New Mexico. The name of the West Texas Gas Company ,a subsidiary of the Prairie Oil and Gas Company, has been associated with this anticipated development. If this project materializes the line will be approximately 400 miles in length. Preliminary surveys have also been made by other interests. A gas strike has recently been reported in Jeff Davis County, north of Chispa, Texas, which is only 135 miles from El Paso.

909 MILES ADDED BY LONE STAR

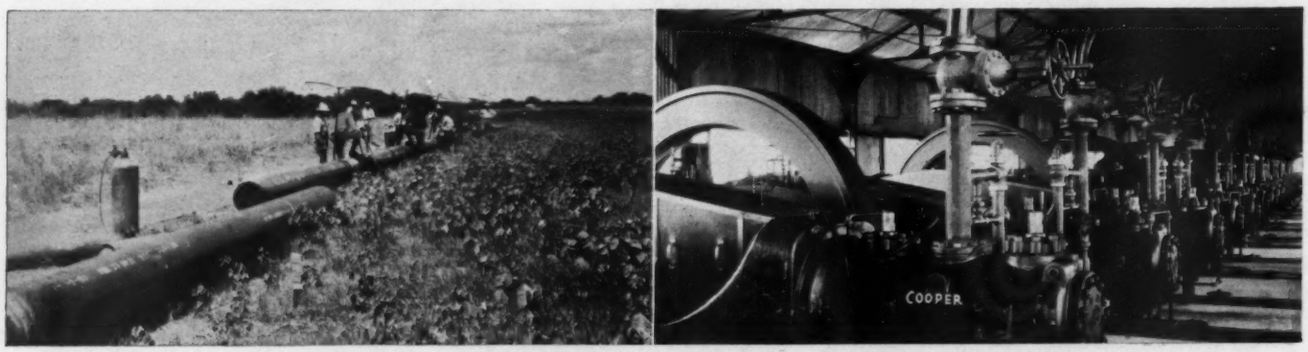
The Lone Star Gas Company of Dallas, Texas, operates probably the largest gas system in the Southwest, serving approximately 180 towns. Sixty-five of these were added in 1927. The domestic consumers at the end of that year were 185,600, with 1,198 industrial consumers. Nine hundred and nine miles were added to the Lone Star system in 1927 and the total of miles now operated is over 3,000. The main source of the gas supply is the Panhandle field, and the Duncan, Fox and Chickasha fields of Oklahoma. Most of the gas reaches the consumer through the Community Natural Gas Company, the Municipal Gas Company, the Dallas Gas Company and the Fort Worth Gas Company, subsidiaries of the Lone Star.

Gas was turned into the Cities Service Gas Company line from Pampa, Texas, to Wichita, Kansas, around January 1st. This line, which is 250 miles in length and was constructed at a cost of approximately $15,000,000, connects at Wichita with the trunk line serving Kansas City. Probably the most productive and most thickly populated area in the Southwest is traversed by this sizeable gas carrier. One hundred and forty-one cities and towns are served wholesale in the district through which it extends. The company has announced plans to extend the line from Wichita, Kansas, to Ottawa, which will provide direct connection of the Texas gas field with Kansas City and other points in northern Kansas. A compressor station completed at Ottawa last fall will enable the company to handle a big volume of gas through this new 130-mile unit of the line. Four other compressor stations boost the gas from its Texas origin to the points of destination.

According to recent reports, a permit has been asked to extend a 12-inch line off of this trunk line through Leavenworth, Kansas, to St. Joseph, Mo.

TEXAS-COLORADO CARRIER

Another mammoth line, 340 miles in length, is rapidly being completed from



LEFT: Welding 18-inch 500-pound high pressure line in Lucas field, Live Oak County, Texas—first loop line laid last fall by Houston Pipe Line Company for its second line to Houston and vicinity from South Texas gas fields. RIGHT: Houston Pipe Line field compressor station, boosting gas to main line station at Edna, Jackson County, Texas. Gas is destined for sulphur mines in South Texas and for consumption in Houston and Galveston

the Panhandle fields of Texas to Denver, Pueblo, and other Colorado cities, as detailed in a statement from Geo. Wehrle, superintendent gas department Public Service Company of Colorado, printed elsewhere in these pages.

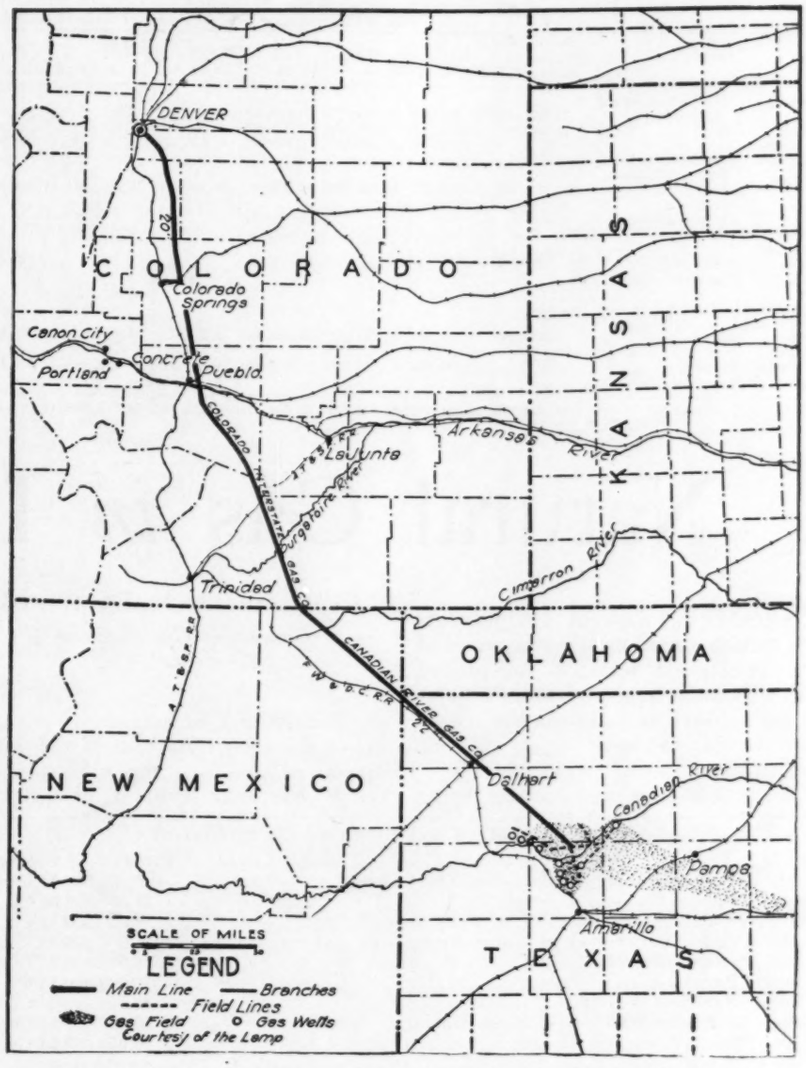
The Houston, Texas, interests are also tremendously active in the transporting and distributing of gas. Houston Pipe Line Company, the parent company of the Houston Natural Gas Company, which is its medium for distribution in towns and cities, operates 575 miles of gas lines. Their main line begins in Webb County, Texas, and ends in Harris County on the Houston Ship Channel, at the plant of the Humble Oil and Refining Company. This company constructed 123 miles of 12¾-inch, 16-inch and 18-inch line in 1927. Some of the representative industries served are Central Light and Power Co., Deepwater Oil Refining Company, Freeport Sulphur Co., Sugarland Refineries, Texas Gulf Sulphur Co., and Texas Chemical Co.

EIGHT NEW GAS TOWNS

The Houston Natural Gas Company operates 215.52 miles of distribution line and serves gas to 18 towns, Houston, South Houston, Texas City, Baytown and Missouri City. Eight of these towns were added to the lines during 1927. A total of 80.48 miles of pipe line were laid in 1927, ranging in size from 2-inch to 12-inch. Thirty-seven industrial customers are served by the company. The major industries among them are Trinity Portland Cement Co., Houston; South Texas Cotton Oil Co., Houston; the same organization at Victoria, and the Houston Textile Mills. The number of domestic consumers is 4,000.

In another place in this issue appears a complete story on the construction of the new Dixie Gulf Gas Line from Waskom, Texas, to Houston, with a branch line running from Goodrich, Texas, to the Texas Company's refinery at Port Arthur. The line was laid by the Hope Engineering and Supply Company and is a Moody-Seagraves project. It is now delivering 53,000,000 feet of gas daily and new contracts being executed make an anticipated delivery by September 15th of 90,000,000 feet of gas.

Two subsidiaries of the Moody-Seagraves interests, the Dixie Gulf Gas Company and the Dixie Gas & Fuel Company, last year added 14 towns to their list of communities served, which now numbers 21. The combined system operated by these two companies totals 405 miles. Moody-Seagraves interests also own one-half of the Reserve Natural Gas Company system.



Course of 340-mile Texas-to-Denver line, now nearly completed

Colorado Cities Come Within Natural Gas Belt

A LETTER from Geo. Wehrle, superintendent gas department, Public Service Company of Colorado, gives *Western Gas* this concise summary of the outstandingly important transmission project which shortly will bring natural gas from Texas Panhandle fields to various communities in Colorado:

Denver, Pueblo and other Colorado cities will be supplied with natural gas from the Amarillo-Texas gas field through a pipeline 340 miles long, being constructed under the direction of Ford, Bacon & Davis Company, Engineers. The line is constructed of 22-inch pipe to the Pubelo connection and 20-inch pipe from Pueblo to Denver.

Work was started at Devine, Colorado, near Pueblo, on December 11, 1927, and on April 13, 1927, 307 miles, or approximately 90 per cent of the pipeline had been laid. It is expected that the line will be completed and natural gas supplied to Denver and Pueblo by July 1, 1928.

In Denver, the work of preparing for the introduction of natural gas is progressing satisfactorily and will be completed by the time gas is turned on. Approximately nine miles of 20-inch intermediate high pressure main will be laid, connecting the town border station with the distributing stations in Denver.

A force of men are being trained for the work of adjusting customers' appliances for the use of natural gas. About 150 men will be used in this work. It is planned to separate the city into 10 sections, turning natural gas into a section at a time. It is expected that it will require 30 days to complete the conversion from the time gas is turned on.

A third company with headquarters in Houston is the Southwest Gas Company, which operates 158.12 miles of transmission lines, serving 13 towns and cities. The principal terminal points of this line are Gonzales, Cross Plains, Stevensville and Comanche. The com-

(Continued on Page 72)

TABLE 1. NATURAL GAS WITHDRAWALS FOR ALL FIELDS IN LOUISIANA
(Published by permission of the Department of Conservation of Louisiana.)

Parish	Field	Prior to 1918 Estimated M. Cu. Ft.	1918 M. Cu. Ft.	1919 M. Cu. Ft.	1920 M. Cu. Ft.	1921 M. Cu. Ft.	1922 M. Cu. Ft.	1923 M. Cu. Ft.	1924 M. Cu. Ft.	1925 M. Cu. Ft.	1926 M. Cu. Ft.	1927 M. Cu. Ft.	Total to Date M. Cu. Ft.
Caddo	(Except Waskom and Elm Grove)	33,000,000	15,603,420	15,820,211	7,460,938	5,812,957	4,911,491	3,369,285	3,316,600	4,839,543	9,003,080	11,956,293	115,093,818
De Soto		10,000,000	6,369,139	4,345,799	3,700,048	2,123,945	1,367,004	1,246,261	1,361,568	1,683,830	1,779,221	1,819,814	35,796,629
Red River			979,711	1,541,567	1,368,335	355,152	117,573	788,542	336,738	321,473	321,298	362,540	6,492,929
Bossier and Caddo	Elm Grove (including Sligo and Caspiana Extensions)	703,532	15,310,071	19,595,960	26,904,390	20,266,160	21,479,736	13,294,431	8,460,102	7,298,665	5,814,191	7,598,818	146,726,056
Caddo	Waskom								135,755	1,270,391	1,053,302	2,047,307	4,506,755
Webster	Cotton Valley							9,950	1,469,891	2,219,695	3,793,083	5,341,223	12,824,842
Webster	Gleason						6,297,304	5,772,198	5,141,656	9,347,084	9,592,886	10,409,651	46,560,779
Bossier and Webster	Spring Hill							272,752	3,543,471	3,500,290	5,840,238	4,119,347	17,276,098
Bossier	Carterville											2,740,432	2,740,432
Winn												3,225	3,225
Morehouse Quachita and Union	Monroe	4,600,000	6,093,000	20,291,000	20,300,503	33,358,327	41,796,843	86,582,443	135,204,603	125,496,213	121,614,208	132,895,666	728,232,806
Richland											950	1,837,404	1,838,354
Terrebonne	Houma		189,604	646,048	890,943	743,317	625,901	555,307	595,666	646,765	483,876	7,141	5,384,568
Sabine												30,931	30,931
	Total	48,303,532	44,544,945	62,240,585	60,625,157	62,659,858	76,595,852	111,891,169	159,566,050	156,614,949	159,296,333	181,169,792	1,123,508,222

Natural Gas *in* Louisiana

By CHARLES A. BREITUNG
Consulting Gas Engineer
Shreveport, La.

FROM the days of gas wastage, which extend back over a period of twenty-odd years, to the present era of potential huge reserves, the natural gas industry in Louisiana has always been forced to seek outlets for its product.

Much has been written concerning the history and utilization of natural gas in the state. An idea of the withdrawal of gas from the various fields can be had from Table 1, above, published by the Mineral Division of the Department of Conservation, State of Louisiana, which admittedly covers only the gas actually measured.

Natural gas in Louisiana has been produced from two sources: as a by-product from oil fields, and from strictly gas areas as such. These latter fields are now furnishing most of the gas.

An idea of the immense reserves of natural gas estimated at the present time, can be determined from the known gas fields existent. (See Table 2).

TABLE 2. PRESENT GAS FIELDS OF LOUISIANA

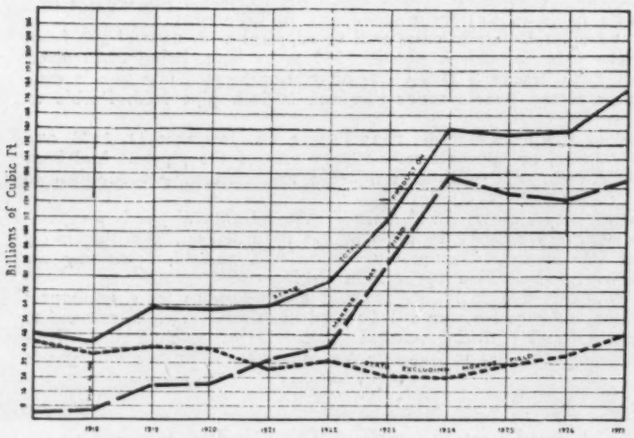
Field	*Probable Extent*	*Estimate of Reserves*
Caddo Parish (excluding Waskom and Elm Grove)		100,000,000 M Cu. Ft.
De Soto Parish		20,000,000 M Cu. Ft.
Red River Parish		5,000,000 M Cu. Ft.
Bossier & Caddo Parishes—Elm Grove Area		25,000,000 M Cu. Ft.
Caddo Parish—Waskom		5,000,000 M Cu. Ft.
Webster Parish—Cotton Valley		50,000,000 M Cu. Ft.
Webster Parish—Gleason		50,000,000 M Cu. Ft.
Webster & Bossier Parishes—Spring Hill		50,000,000 M Cu. Ft.
Bossier Parish—Carterville		5,000,000 M Cu. Ft.
Winn Parish		(unknown)
Morehouse, Ouachita & Union Parishes, Monroe	350 sq. miles approx.	2,100,000,000 M Cu. Ft.
Richland Parish	60 sq. miles approx.	1,000,000,000 M Cu. Ft.
Sabine Parish		(unknown)

Note: The above estimates have been and are subject to profound changes as developments occur in the various gas areas. No definite figures can be attempted because of so many factors intervening.

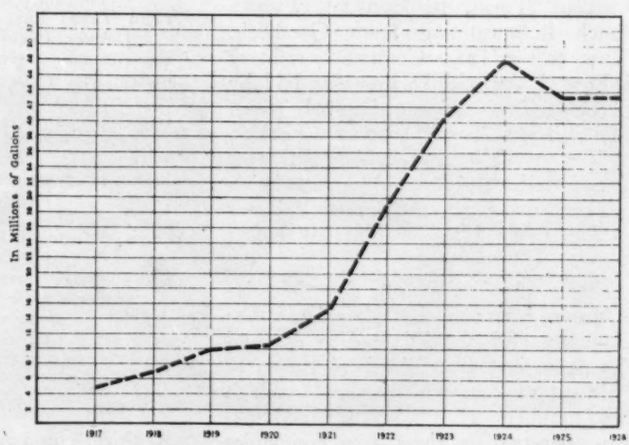
HISTORY OF THE INDUSTRY

In 1906 natural gas was piped into the city of Shreveport through a 6-inch line from the Caddo oil field district, which soon developed into considerable proportions.

In 1910 the Arkansas Natural Gas Company built a 200-mile 16- and 18-inch line from Caddo Parish to Little Rock and Hot Springs, Arkansas. These

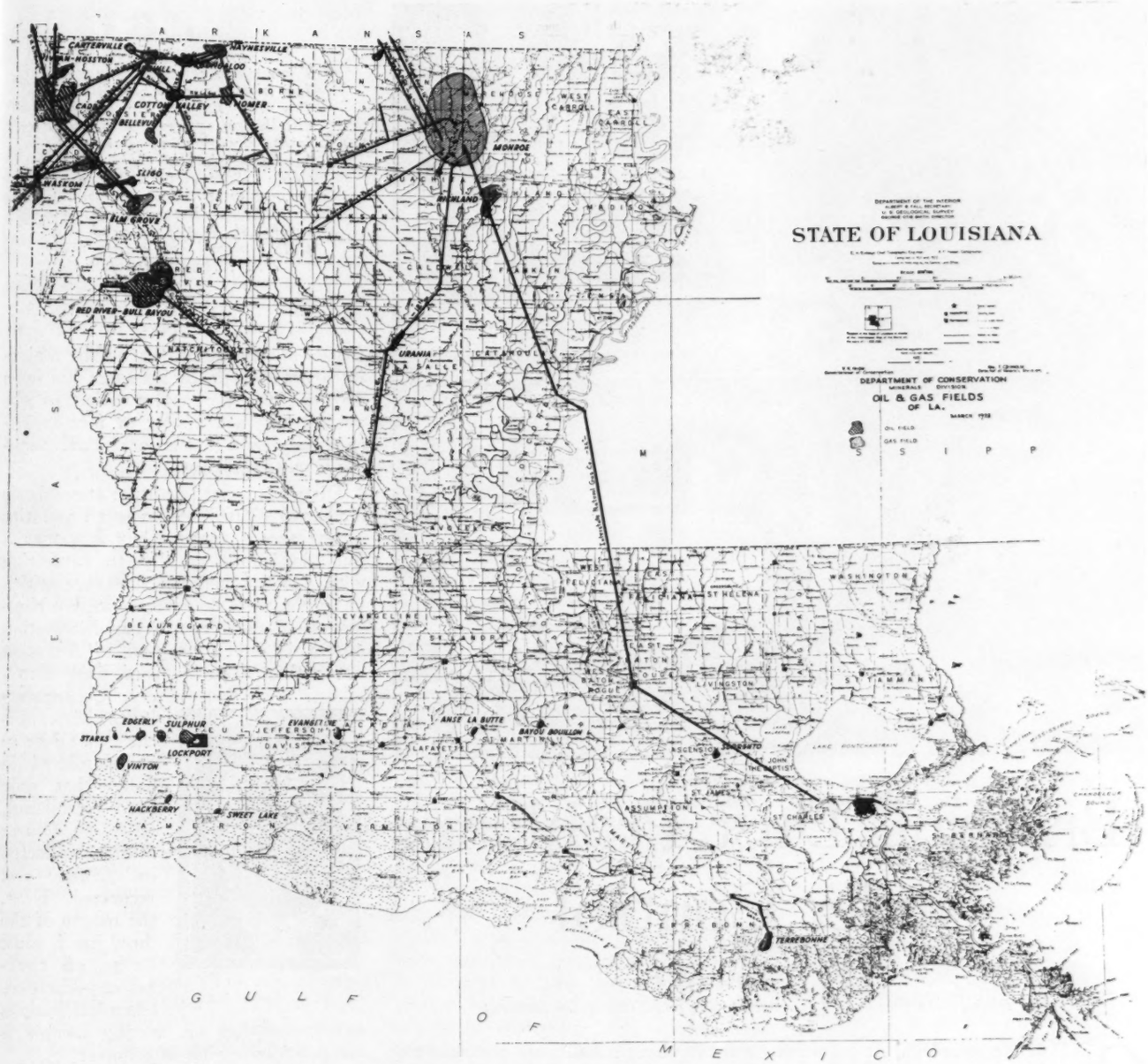


Natural gas production for the State of Louisiana.



Natural gas gasoline production, State of Louisiana

Charts by Minerals Division, Department of Conservation, State of Louisiana. Wm. F. Chisholm, director. V. K. Irion, commissioner of conservation.



Louisiana's tremendous gas reserves, and the considerable transmission activity reflected in the gas lines charted, are evident from the map reproduced above.

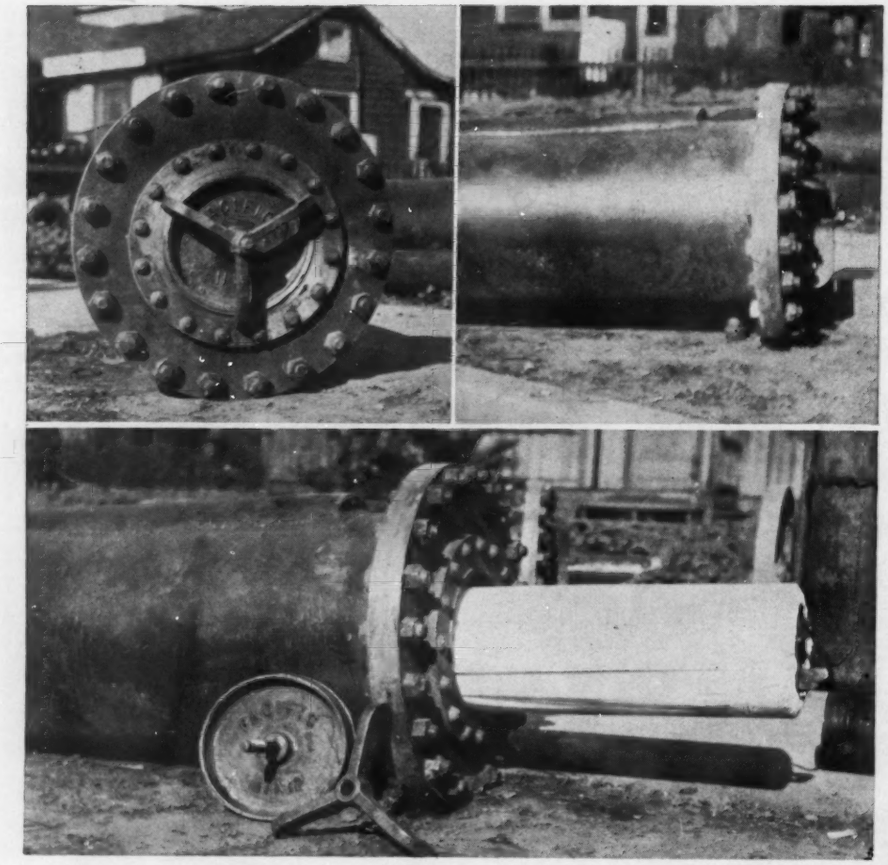
systems were augmented and supplemented as further gas and gas bearing oil areas were discovered, so that by 1915 a net-work of feeder lines extended all over Caddo Parish for a distance of several hundred miles. A brief word might be said, in passing, of the courage and the vision required by the Arkansas Natural Gas interests in projecting a line, which has since witnessed a continued increase in gas available every year. Much of the extensive and careful development of gas—unwelcome as the gas discovery often was—can be credited to the major oil companies and other large operators whose gas departments fought the good fight year in and out. With the formation by the State of Louisiana of a Conservation Department to aid in the development and protection of all natural resources, an important change took place which has resulted in the salvage and prolonged life of the numerous gas fields in the State. The present vast potential reserves give evidence of what co-operation between the operators and the State can do. Louisiana today points with justifiable pride to its program of conservation and the enlightened manner in which harmonious accord is reached between all parties concerned.

(Continued on Page 76)

TABLE 3. CARBON BLACK PRODUCTION

Year	U. S. A. Total Pounds	Louisiana Total Pounds	Louisiana Percentage Total	M Cubic Feet of Gas Used Louisiana	M Cubic Feet of Gas Used U. S.A.	Average Pounds Louisiana	Per M Cu. Ft. U. S. A.
1919	52,056,941	14,024,606	27.0	21,200,000	.....	....	....
1920	51,321,892	18,565,498	36.2	21,000,000	.....	....	....
1921	59,766,315	31,003,615	51.9	32,072,000	50,565,000	.97	1.2
1922	67,795,129	41,966,856	62.0	38,004,000	53,629,000	1.1	1.3
1923	138,262,648	101,398,881	73.3	82,974,000	109,096,000	1.2	1.3
1924	186,872,034	144,601,550	77.5	127,812,000	156,514,000	1.1	1.2
1925	177,417,378	129,839,907	73.2	118,869,000	149,855,000	1.09	1.2
1926	180,576,176	129,564,840	72.2	108,145,251	139,400,000	1.19	1.3
1927	Incomplete	126,563,477	....	99,282,477	.....	1.28	....

Authority: U. S. Bureau of Mines and Minerals Division, Department of Conservation, State of Louisiana.



These views show the new style dust trap in use on Los Angeles Gas and Electric Corporation distribution system. Top, left: front elevation of dust pot, hand-hole plate in place. Top, right: Side elevation of dust pot, showing inlet and outlet connections. Bottom: Side elevation of dust pot, hand-hole plate removed and muslin covered cartridge exposed

Bringing Dust Problems Under Control

By R. C. BOUGHTON

Gas Distribution Engineer, Los Angeles Gas and Electric Corporation

ONE of the most difficult problems confronting every gas distribution superintendent or engineer is how to eliminate or control conditions created in a gas distribution system by the presence of very fine dust in large quantities.

Utilization appliances are caused by this adulterating material to function badly (in many cases not at all), eliciting thereby many complaints from consumers who would otherwise be perfectly satisfied with the service rendered. Mains are so reduced in carrying capacity that in very many cases practical superintendents have little or no faith in calculations because these calculations fail sometimes to be verified by check with actual performance as observed.

If these conditions are created by the presence of such a material, the logical thing to do is to eliminate it or to control it; but this has heertofore not been an easy task. Possibly the wrong viewpoint has been taken in the past, and this is the reason for the lack of success. Let us see if this is so:

First of all, it is admitted that the preferable method of elimination or control is the absolute removal of the dust; therefore air filters have been almost universally adopted as a means of dust elimination, or at least as a basis of design for modified filters considered to have more suitable attributes and greater possibilities. They are rated as being so-and-so per cent efficient, and by examination of the air or gas issuing from them on test this percentage or rating is usually found to be fairly accurate. However, the air filtered does not contain very much dust, so the filtering medium can be very tight or close and little concern need be given the precipitate collected. This is usually so small in comparison with the great volumes of air going through them under the usual conditions of application that in the majority of cases little or no space has been provided for the accumulation of the precipitate; as a matter of fact experience has shown that an occasional cleaning is quite sufficient.

Dirty gas is not like usual atmospheric air barely diluted with a small quantity of extraneous matter, but is rather a fluid loaded practically to saturation with a heavy metallic substance which in its nature is abrasive; hence the elimination of dust from a gas distribution system is not a problem of filtration but rather a problem of dust recovery. Consequently the first salient feature to be considered in design has now been established, to-wit: Dust must be collected in quantity and recovered. Next, the nature of the dust, itself, must be given careful consideration. Chemical analysis will show that the average sample is composed somewhat as follows:

R. C. Boughton

Ferric sulphate, $Fe_2(SO_4)_3$	0.83%
Ferric oxide, Fe_2O_3	77.63%
Iron, Fe (Metallic)	3.42%
Alumina, Al_2O_3	2.76%
Free sulphur, S	1.31%
Oil	0.55%
Organic Matter (Carbonaceous)	0.51%
Silicious Matter	2.60%
Water of hydration and carbon dioxide	10.39%
Total	100.00%

and physical analysis will show the material to weigh about 125 pounds per cubic foot; and in degree of fineness to analyze about as follows:

Passing 200 mesh	20.0%
Passing 100 mesh	25.5%
Passing 80 mesh	12.5%
Passing 50 mesh	20.5%
Passing 40 mesh	7.5%
Passing 30 mesh	4.8%
Passing 20 mesh	3.7%
Passing 10 mesh	2.5%
Total	100.0%

Thus are established other features of design, and the dust trap which will successfully meet the situation must have the following characteristics: First, it must possess a screen of some material fine enough to intercept particles of dust so fine that they may be, for practical purposes, considered colloids; and, second, this screen must have sufficient area that it will not cause a harmful pressure loss across the dust pot from inlet to outlet; and third, it must have a reservoir of sufficient capacity to collect and hold a quantity of dust not less than three or four hundred pounds. Fourth, it must be provided with some means of easy access to this reservoir so that the effort and time required to by-pass this trap out of service and clean it may be reduced to a minimum.

THE DUST TRAP DEVELOPED

The dust trap shown in the photographs and diagram is submitted as having the necessary attributes, and its description is as follows:

A piece of 20-inch outside diameter pipe about six feet in length was closed at one end by welding in a plate, and at the other end with a standard bolted blind flange. Two connections were made to the welded end, one being the inlet, the other outlet, and both were six inches in diameter. The outlet was welded on so that its axis was a continuation of the axis of the 20-inch pipe. In this outet a bronze rod was affixed projecting into the 20-inch pipe and almost reaching the flange at the opposite end. A screen covered with a good grade of muslin was arranged to slide over this projecting rod and be fastened in place. The screen was inserted from the blind flange end. The area of muslin, effective for filtering out fine dust, was approximately 1,800 square inches. The area of the six-inch inlet pipe was 28.89 square inches. The cover-flange was arranged with a quick-opening hand-hole to facilitate removal of screen and accumulation of dust. Gas enters through the inlet and disperses around the screen from the exterior to the interior. The dust is caught upon the cloth and as the accumulation increases it finally drops from its own weight to the bottom of the 20-inch pipe where it remains until later removed.

WHERE INSTALLED

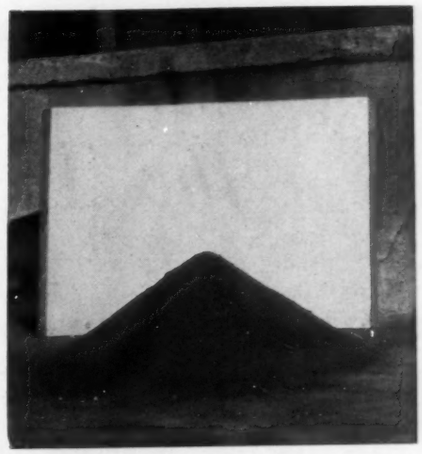
The installation of these dust traps is usually made at automatic control valves (governors or regulators) where velocities are known to be high; however, in some cases it was found advantageous to install traps in multiples within pits constructed exclusively for the purpose of dust arrest.

Results obtained in the writer's experience have been very satisfactory. In neighborhoods where traps were installed complaints ceased as if by magic. Accumulations of three hundred prounds of dust in twenty-four hours have been taken from the traps at locations where conditions were exceedingly severe. Up to this writing practically 20,000 pounds of fine dust has been removed from the system of the Los Angeles Gas and Electric Corporation, and this since the 10th day of December, 1927, when the first trap of this nature was installed.

CARE IN CLEANING DUST TRAPS

Suitable methods have been worked out for cleaning traps so that residents nearby will not be annoyed by the fine dust blowing on their foliage, walks or houses. The dust is shoveled into calibrated buckets, a record made of the quantity, and then emptied into covered cans. The material is so particularly heavy that with due diligence it can be kept from blowing away.

Our workmen have been provided with dust-proof goggles and gas-masks for their protection. Every known precaution has been taken to eliminate the hazard of explosion. The bronze rod mentioned in the description of the dust trap is one of these. It is not considered possible to generate a spark from a bronze rod, when withdrawing the screen, as on a steel one. The men are cautioned about nails in the soles and heels of their shoes, and have been instructed, while down in the governor pits, when striking metallic objects with tools to strike against a block of wood.



Pile of dust one foot high and more than three feet wide, weighing over 300 pounds, was taken from a dust trap in 24 hours

It is amusing to note one case in our experience: During the 10-minute interval while the governor by-pass was opened to supply the territory while the dust trap was being cleaned, about two dozen complaints from the area served immediately flashed into our central complaint department; but as soon as the dust trap was again placed in service, the complaint calls ceased. This, we believe, is mute testimony as to the efficacy of the trap designed.

DUST TRAPS HAVE TWO VIRTUES

These dust trap installations have two virtues, the first being that as soon as the initial cost is offset by a definite number of complaints prevented (and this is determined from a comparison of complaints before and after the installation), the trap actually becomes an investment to the corporation in that it prevents future complaints. The second virtue is that as a means of eliminating one of the chief causes of unsatisfactory service to the gas consumer, it becomes an important instrument in the promotion of good public relations.

Instead of eliminating dust by methods of recovery it is possible to accomplish very good results by injecting oil into the gas as it leaves the gas works. Also, by means of various devices it is possible to automatically inject oil at various strategic points on the system. The oil vapors will finally penetrate the whole system and the fine dust will be firmly cemented to the walls of the pipe, and so, for a time, will afford at least temporary relief. Permanent relief cannot be credited to oil injection, prin-

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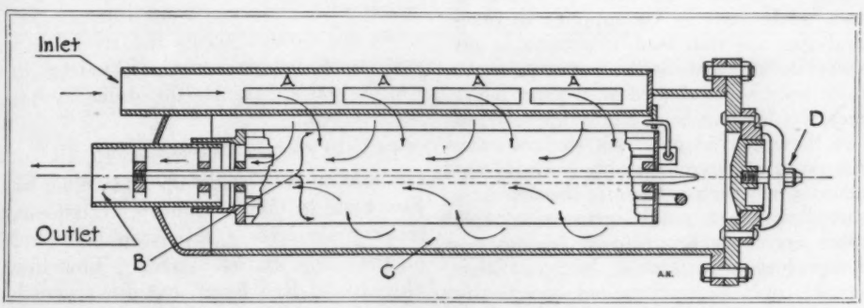


Diagram of dust trap. Gas enters inlet pipe, passes through slots (A), thus breaking flow so as to prevent tearing of muslin bag (B). Dust is caught on cloth and finally drops by gravity to bottom of trap (C). Hand-hole (D) is for removal of screen and dust

Twenty Years *of* Growth *on the* Lone Star System

By F. L. RICHARDSON
Lone Star Gas Company

IN 1909 the Lone Star Gas Company was incorporated for the purpose of producing and transporting natural gas, and its system consisted of a 16-inch line, approximately 90 miles long, extending from Petrolia Field which is located in the northern part of Clay County, Texas, about 15 miles northeast of Wichita Falls, to Fort Worth. This effort marked the beginning of natural gas development in the Southwest, for, I believe, it was the first major transportation line to be completed in this section of the United States.

In passing it might be interesting to relate a little of the history of the company and touch briefly upon the growth and development of the cities and towns in what is known as the Southwest, in order to get a better understanding of just what has been the demand for a constantly increasing quantity of service, as well as what has been done to meet that demand and at the same time attain the highest quality of service.

FIGURES ON SOUTHWEST GROWTH

At the time of completion of the above mentioned line from Petrolia Field to Fort Worth, the total population served by the company, including three or four small towns along the line, was only a little over 79,000. The 1910 census of Fort Worth shows a population of 73,312. In the 18 years that have elapsed the Lone Star Gas Company has been called upon to provide means and facilities for serving a population which, in Fort Worth alone, has increased in the neighborhood of 150 per cent, as the present population of that city is estimated near the 200,000 mark.

Shortly after the completion of the line to Fort Worth, a 16-inch line was constructed from Fort Worth to Dallas, a distance of about 35 miles. This addition increased the total population to which the company rendered service by 92,104 people, as shown by the 1910 census. Since then, the growth of Dallas has also been remarkable, its population having increased to a point somewhere near the 250,000 mark.

These figures are given merely to emphasize the tremendous growth that has taken place in the Southwest within the past two decades, but it should be borne in mind that the growth has in no way been limited to the large cities. On the other hand it has been a most general and widespread development. A number of our present thriving, bustling cities that are daily assuming a more metropolitan aspect, were 20 years ago, mere towns; and the then vast expanses of prairie and grazing lands are fast becoming small tracts of highly developed farms.

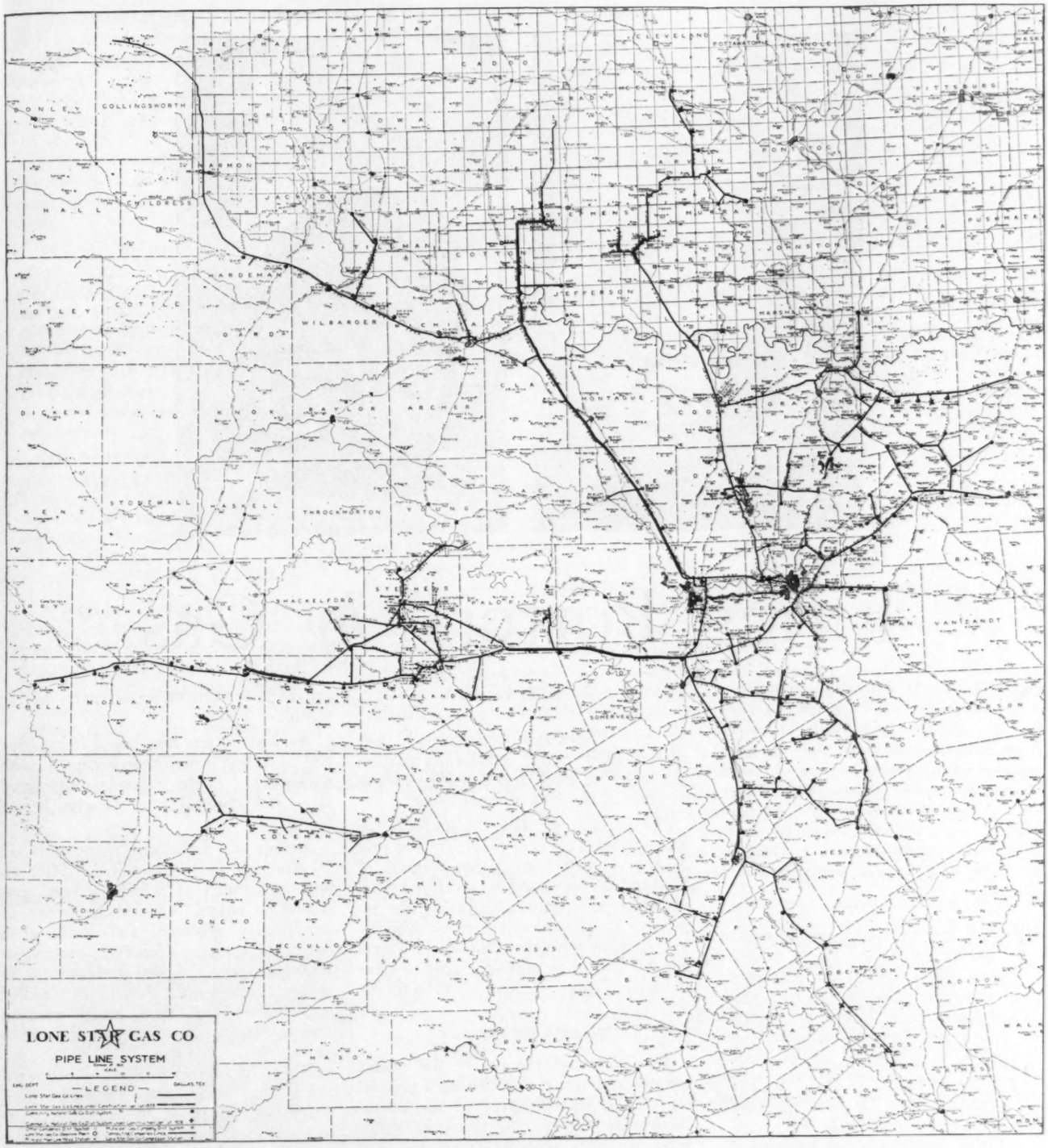
INDUSTRIAL DAY AT HAND

Coincident with this phase of Southwestern development there has been another, and even more important, growth along industrial and manufacturing lines. It has long been known that the natural resources of the Southwest, properly developed, would add greatly to the wealth of our nation, but only recently have business men generally come to realize the tremendous possibilities that await development in this section of the country. Within the past few years this realization has borne fruit to such an extent that throughout all this section industries can be found producing almost every conceivable article. Plants are operating full time manufacturing everything from saddlery to cotton gins, perfume to automobiles, and yet the development has only started.

Throughout this period of development there has, of course, been a constantly increasing demand upon the Lone Star Gas Company for service, and while sources of supplies of natural gas are not readily obtainable on short notice, and in one or two cases have been very elusive at a time when they would have been highly appreciated had they "stayed put," yet the company can point with considerable pride to the manner in which it has met the demands that have been made upon it, and it takes considerable pride in having accomplished a system so laid out that service may be maintained practically one hundred per cent throughout regardless of the unforeseen difficulties which arise from time to time.

It should not be assumed, however, that its entire path has been a rosy one There have been times, quite a few of them, when the question "Now what shall we do?" would have been difficult to answer. For several years after it was first tapped Petrolia Field continued to be the one source from which all supplies were taken, but the system had been enlarged by the construction of a line from Bowie to Gainesville and thence to Sherman and Denison; also a line from Gainesville to Dallas with a branch to McKinney, and a line was constructed from Petrolia to Wichita Falls. With the increased drain on the field and its natural decline, it soon became apparent that additional supplies must be sought. Large quantities of gas had been developed in Cotton County, Oklahoma, some 30 miles north of Petrolia, and a 12-inch line was laid to that field. This, however, necessitated crossing Red River, which has a bed of quicksand some 15 or 20 feet in depth, and it is most treacherous during periods of high water. In order to insure continuous service this crossing was made with five lines, properly clamped, and every precaution was taken to make them remain in place. During the first flood I believe all five lines went out. At any rate, it was evident that river bed lines were not satisfactory, so after many attempts with the river lines, a trestle bridge was constructed, carrying lines over the river. The lines were also maintained in the bed, but every so often during extreme periods when underbrush accumulated in large quantities around the piling of the bridge, out would go a couple of bents, pipe and all, and again Cotton County gas would be cut off. At present our lines at this point are carried across the river on a suspension bridge some 2500 feet in length, and apparently this difficulty has been solved.

In 1917 the line from Bowie to Gainesville was taken up and relaid to Fox Field in Carter County, Oklahoma, making available a supply at each end of the "U" shaped system. This line also crossed Red River, but due to much more favorable river conditions here we have never experienced any serious difficulty due to washing.



Heavy lines indicate natural gas transmission system of Lone Star Gas Company. Broken lines show pipelines under construction January 1, 1928

With the exception of the extension east from Cotton County into Stephens County, Oklahoma, the system remained as shown until 1920. By that time enormous quantities of casinghead gas had been developed and were being treated in the Ranger District of Eastland County, in West Texas, and also in the Breckenridge territory just to the north in Stephens County, Texas. At that time a large portion of this gas was being wasted at the gasoline plants. A 16-inch line was built from a point northeast of Fort Worth to Joshua and the 18- and 16- inch lines from Joshua west to Ranger and Breckenridge. This gas, being treated at low pressure, was not capable of entering our lines against line pressure, and it was necessary, therefore, that compressor stations be constructed to handle the gas into our lines. Three of these stations located just west of Ranger have a total of 4,140 horsepower, while the stations at Breckenridge and Caddo are of 2,720 horsepower each, and the station at Ibex, in eastern Shackelford County, has 3,925 horse-power.

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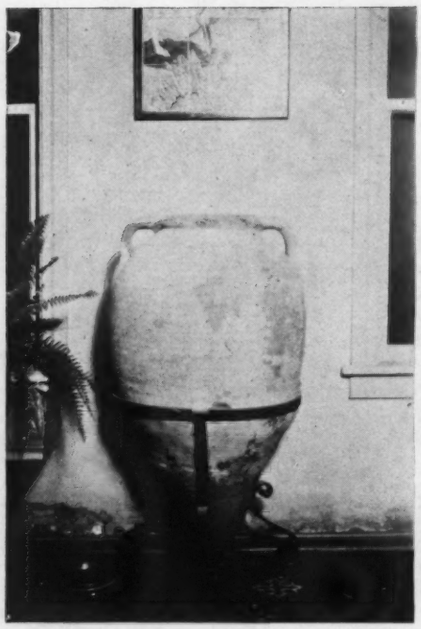


THE OLD
This earthenware wine jug was found in Carthage, Italy, and its age is estimated at 2,000 years

THE NEW
A modern ornamental vase, fired in a kiln burning natural gas fuel, which excels in this use

Firing Pottery *by* Gas

By LEE HOLTZ

NOT only in Southern California but also in the Mid-Continent and Southwest the ceramics load stands out as one of the most important on the lines of natural gas companies. For a number of months Mr. Holtz has been sharing with *Western Gas'* readers the benefit of his experience with this class of industrial on the system of the Southern California Gas Company, for which he is assistant superintendent of distribution.

THE discovery and use of natural gas has perhaps done as much, if not more, toward the present development of the gas industry as a whole than any other one thing. Fortunately, the supply has been in abundance and obtainable at low cost in the thickly populated parts of our country, where manufacturing was one of the principal industries.

Without question many uses for gas fuel are now present that would have taken years of research and effort to develop had it not been for natural gas.

Among the pioneers who first used natural gas in the industrial field were the clayware manufacturers of Ohio, Pennsylvania and Kansas, and their experiences have been broadcast throughout the entire country, stabilizing the use of gas generaly, not only in the ceramic trades, but in many lines of industry. It is not at all common today to meet "burners" who started their careers in the early days when natural gas was first used, and considerable can be learned from their experiences.

Today, as yesterday, the major problems in any clayware plant are the production of better ware, conservation of fuel and an increased kiln turnover, all of which are continually taxing the ingenuity of all concerned either directly or indirectly with the business. Natural gas has helped to a great extent to solve these problems for many manufacturers.

HISTORY OF POTTERY

In order to bring before the reader examples of actual experiences, a general description will be given of the manufacture of pottery. At this time stoneware products will be considered, but before going into the actual manufacturing processes, it may be of interest to touch briefly upon the history of pottery.

The invention of pottery dates from the most remote period and its application is almost universal. Evidence of the fact that all peoples of the earth, even in the prehistoric ages, learned and practiced the art of making pottery is continually being presented by the finding of cinerary urns, water vases and other pieces of similar nature in old graves and barrows in all parts of the world.

Ancient pottery was baked in an open fire and was usually ornamented with patterns of straight, crossed or zigzagged lines and stamped into the clay before firing.

Among the prehistoric patterns found in America are those called "Mexican pottery," much of which is very grotesque in shape, modeled in forms of semi-human monsters and made of a hard, black clay. However, many patterns are very graceful and natural in shape, either highly colored or finished in soft, delicate shades which modern manufacturers find extremely difficult to imitate.

The first pottery made in the United States was white ware, manufactured about the year 1684. Recent U. S. pottery includes white granite, better known as iron-stone china; red earthen ware (used for flower pots and water filters), made of brick clay either glazed or unglazed yellow ware; (baking dishes, crocks, etc.) made of various buff colored clays; porcelain and semi-porcelain (used for high grade vases, spark plugs, etc.), made from a plastic mixture of clays, flint and felspar.

The term "pottery," supposed to be derived from *poterion,* the drinking cup of the Greeks, and transmitted by the French word *poterie,* is applied to *all*

objects baked in clay. However, when one speaks of pottery today, most people immediately visualize some earthen or stoneware vessel, such as a vase, jug, pot or crock, and rarely would brick and tile, which are also classed as pottery, be thought of as such. For this reason the word "pottery," as herein referred to, can perhaps be considered correctly used according to the modern conception.

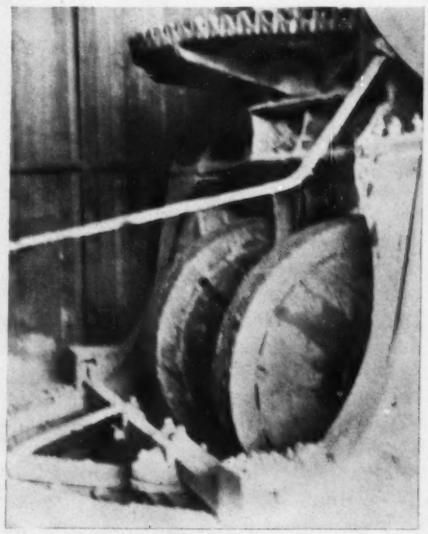
It will be impossible in this brief space to give a detailed description of the manufacture of the great variety of pottery products which ranges from cheap earthen ware such as flower pots to the higher grade wares in the delicate porcelain line. Therefore, the choosing of stone and red earthen ware, so very familiar to all, would seem very appropriate.

In the manufacture of pottery there are certain operations common to all forms, but with the higher grades of ware much more care and detail are necessarily involved.

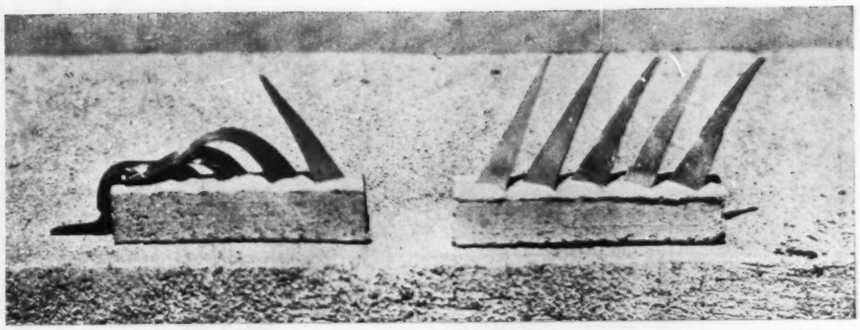
STONEWARE DEFINED

Stoneware as referred to here may be considered as a crude porcelain containing a large percentage of silica in the plastic material which, when fired, vitrifies the body, insuring closeness and hardness. It may be characterized by a glassy fracture and when struck it sounds with a clear ring. It is homogeneous throughout its thickness and is resistant to fire, water and all acids but hydrofluoric.

The general operation consists in the preparation of the raw material by mixing and grinding, either by dry pan method or a roller crusher, and sometimes in addition to crushing the material is passed through a pulverizer and then air-floated to separators to settle the dust, which is usually done by the aid of canvas bags suspended in a vertical position.



Dry pan for grinding clays



Pyrometric cones

From the separator, the material is then put through a pug mill, from which it emerges in a very plastic form in the shape of a bar. From here it is piled on portable platforms and covered with wet sack material and allowed to age.

After ageing, the material is then ready to be shaped into the various forms, such as crocks, jugs, vases, bean pots, etc. The majority, being round, are shaped on what is known as the "potter's wheel." This consists of a fixed table through which the axle passes, rising a little above its surface and having on its upper end a disc which revolves with it. The axle is put into motion by turning the flywheel, either by hand or machinery, and this causes a rapid revolution of the disc, upon which is placed the soft mass of clay to be molded. Some articles are formed in molds of Plaster of Paris. Plaster molds are very advantageous where the ware is to be thin, as the plaster absorbs much of the moisture and thus practically dries it so that it may be more easily handled. Plaster molds are also necessary where the ware is so shaped that drawing would be impossible without the aid of loose pieces in the mold.

Many pieces of pottery are made by what is known as a "jigging" machine, which is very similar to the potter's wheel except that the shaping of the object is done by a hand-operated lever on which a template is fastened. This method is extremely fast and accurate.

After shaping, the ware is placed on drying pallets and immediately placed in humidity driers in which it remains from two to five days, depending upon the size and weight of the object.

After drying, the pieces then go to the glazing department, where they are coated with a vitreous slip material containing lead. The pieces are usually dipped, except in the case of small ware where only the inside is to be coated. This is done by placing the piece to be glazed over the open end of a small pipe which stands in a verticle position a few inches above the tank of solution; by the aid of a foot lever which is fastened to a pump, the material is squirted into the vessel.

When the slip material is dry the ware is placed in the kiln and firing is started.

The kiln's load is usually made up of all kinds and shapes. Therefore saggers are employed only as a means for safely stacking the ware which is more or less uniform in size.

Stoneware products are usually finished in one firing. However, in certain classes of ware, it is necessary to fire the bisque and then decorate or glaze and fire again. In this event, the same kiln is often used for both operations by placing the bisque ware in the top of the kiln and the glost in the bottom.

KILN CAPACITY

The unit of kiln capacity for firing pottery is unlike that for most ware, capacity in this case being figured in gallons instead of by the ton or piece. The usual round down draft type of kiln is used and one 30 feet in diameter will hold approximately 8,000 gallons of the ordinary type of ware such as crocks, jugs, bean pots, etc. If the ware is of a vitreous nature, it is fired to cone 9 (2345° F.) and requires approximately three days' time. About 250,000 cu. ft. of 1100 B.t.u. natural gas is required for the operation.

Upon completion of the firing of the vitreous ware and after proper cooling time has been allowed, the ware is removed from the kiln and an absorption test is made on several pieces, running about .25 of 1 per cent.

Non-vitreous ware, such as soft red products (water filters, flower pots, etc.) is burned to cone 2 (2129° F.) and requires about two days' time. A kiln 18 feet in diameter will hold approxi-

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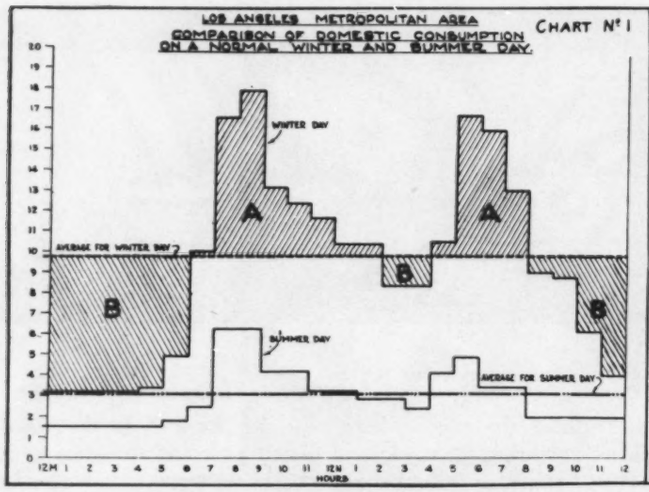
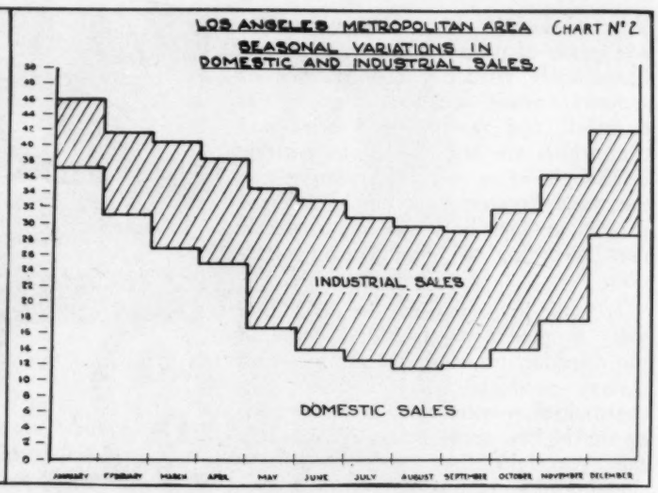




California's Natural Gas Problems

By WM. MOELLER, JR.

Manager Natural Gas Department
Southern California Gas Company

THE nature of the gas production available to any gas utility, that is, whether dry gas from gas wells, or casinghead gas from oil wells, has a decided influence on the operations of that particular utility. For example: A supply of natural gas from dry gas wells can be regulated and controlled to meet the varying demands of the market, whereas the supply of casinghead gas from oil wells is produced at practically a uniform rate over which the gas utility has little or no control, and which supply must either be used as produced, or allowed to waste, if there is no use for it at the time it is produced.

A CASINGHEAD SUPPLY

The major portion of natural gas produced in California is casinghead gas, and for that reason, a perplexing utilization problem is presented to the California gas utilities. This is contrasted to the natural gas business in the eastern and mid-continent fields, where practically the bulk of natural gas production comes from gas wells, over which the utilities exercise control.

Where the natural gas utility derives its gas supply from gas wells, it is generally in a position to regulate its market so that it supplies only the preferred business, bringing the highest average price for its product; whereas, the gas company having available primarily a supply of casinghead gas is in the position at time of excess production where it must find a market for its product in competition with other fuels. The California utility, under such conditions, is handling a relatively larger volume of gas, which it sells at a very much lower average price. In the marketing of casinghead gas, the gas utility renders a service, not only to the consumer, but also to the producer, acting practically as the producer's agent in finding a market for his excess gas production.

When the supply of casinghead gas becomes insufficient to meet the gas utilities' requirements, it becomes necessary to use dry gas from gas wells to make up the shortage, and where this supply is limited, as is the case in California, the gas utility may find itself in the embarrassing position of not having sufficient gas to meet its requirements.

To guard against this situation, the gas utilities maintain gas manufacturing plants, in which so-called "oil-gas" can be manufactured from oil. These manufacturing plants are primarily used as "stand-by" plants to take care of emergencies, caused by breakage of natural gas transmission mains supplying various distribution districts, and also to meet peak load requirements. In case of a shortage in the supply of natural gas, the service to industrial consumers is reduced or cut off.

CONDITIONS of gas supply and character of load in California necessarily differ considerably from those obtaining elsewhere. Some of the factors governing gas service in California are described by Mr. Moeller in the paper published on this page, and given at the April meeting of the California Natural Gasoline Association.

Wm. Moeller, Jr.

The introductory portion of Mr. Moeller's paper, dealing with state regulation of utilities in California, is omitted below, the published portions concerning general aspects of natural gas production, transmission and utilization in the author's state.

TRANSMISSION PRESSURES

The maximum pressure used for transmission of gas in California is about 400 pounds, and welded pipe line construction is uniformly used; whereas, in the east, many pipe lines are operated with maximum pressures of 300 pounds to 350 pounds, and coupler construction, using plain end pipe, is still very generally used.

In the distribution of gas to the consumers, both low pressure and "intermediate" high pressure systems are used. In the intermediate high pressure system of distribution, smaller distribution mains are required by reason of high pressures maintained therein, and individual house regulators are installed at each service or meter in order to reduce the gas pressure to about eight inches of water for proper utilization in house appliances. In the low pressure distribution system, relatively larger mains are required and no individual house regulators are needed in the service or house meter, because gas is distributed at sufficiently low pressure to properly serve house appliances. In the distribution of natural gas, the high pressure system is generally used, because gas is available at higher pressures at the distribution center, thus obviating the need of compressing gas, as would be the case when manufactured gas is used. The economy in high pressure distribution is in the smaller investment in mains required for distribution.

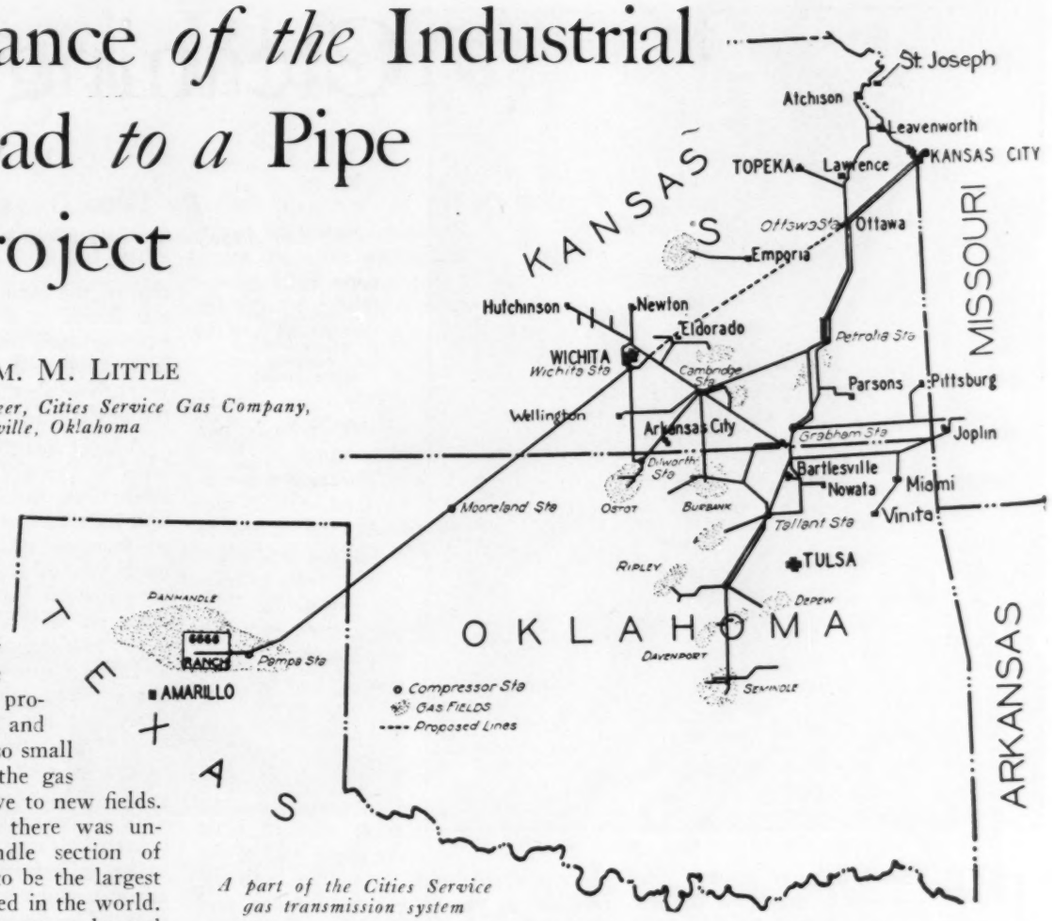
The most essential use for gas is to supply the so-called domestic require-

(Continued on Page 75)

Importance *of the* Industrial Gas Load *to a* Pipe Line Project

By WM. M. LITTLE

Chief Industrial Engineer, Cities Service Gas Company, Bartlesville, Oklahoma



A part of the Cities Service gas transmission system

THE natural gas industry is continually being faced with the problem of going to new fields for its supply. The old fields, like the oil producing areas, play out and the production becomes so small that in order to keep the gas markets supplied we move to new fields.

Some few years ago there was uncovered in the panhandle section of Texas what is thought to be the largest gas reserve ever discovered in the world. This field unfortunately was so located that in order to get this gas to paying markets it would be necessary to lay many hundreds of miles of large pipe lines entailing the expenditure of several millions of dollars.

STUDY POTENTIAL MARKETS

Our company began a thorough study of the potential markets along its present system and in the Mid-Continent area in order to determine whether we should be one of the first to bring this gas to those markets. In making this study we divided the gas markets into three classes. First, domestic markets: including house heating, small commercial, etc. Second: preferred industrial. Third: non-preferred industrial.

Except for those towns many miles removed from our general main line system, the domestic markets of importance have been absorbed either by our company or by other companies. The domestic gas by itself, while probably a good revenue producer, has its drawbacks from an operating standpoint. Due to the high quality of natural gas and its low price it is used extensively for heating homes in this territory. This means that domestic business alone has a poor annual load factor, As we could expect only a normal increase in this class of business and practically no increase in overall load factors, it is quite evident that to spend large sums of money for this business alone would be folly, to say the least.

Even though the domestic situation could offer us little from a standpoint of added deliveries, it is the controlling factor on which we could base the amount of industrial gas we could safely deliver. We must bear in mind that the domestic customers must be served 365 days in the year and knowing the load factor, we were able, at least partly, to say what we could expect to do in the other two classes.

DETERMINING LINE CAPACITIES

Before getting into a discussion of the industrial markets there was another problem which required considerable study. That is the carrying capacities of our lines in different points on the system. In order to thoroughly inform ourselves we divided the general main line system into six divisions and made an analysis of the ability of our pipe lines and compressor stations to handle gas in each of those divisions. With this information before us and a thorough knowledge of the domestic situation, we were then in position to determine the amount and class of industrial gas we could safely handle.

As before stated, we divided industrial gas into two classes, preferred industrial, or that load which must have continuous service throughout the year, the same as we give our domestic customers; second, non-preferred industrial, or that load which can be shut off at any time we need the gas for other markets. In order to give clearer understanding of the method of proportioning this business we will assume we are able to deliver in one of our six divisions, 100 million cu. ft. of gas per day. This division has a peak domestic daily delivery of 75 million cu. ft. This means that we could take on an additional 25 million cu. ft. average per day preferred industrial load, but due to the poor load factor on domestic consumption, it is evident that our average domestic delivery is only 26 million per day for the year. We take 26 million from the 75 million cu. ft. domestic we are capable of handling, and we have a figure of 49 million cu. ft. daily that could be sold in industrial plants, provided we could shut off those plants when the domestic load was at its peak. This

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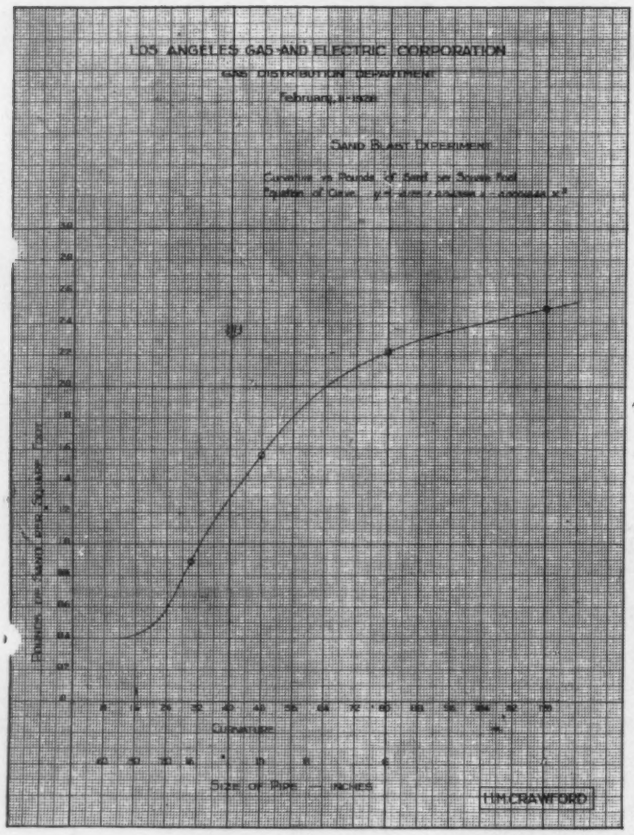
Cleaning Pipe

By FRED BENSON
*Los Angeles Gas and Electric Corporation**



LEFT: Curve plotted to show relation between quantity of sand used per square foot and the curvature of surface blasted.

THE general opinion among pipe line engineers is that pipe should be thoroughly cleaned before treatment with any kind of paint or asphaltic wrapping. The Los Angeles Gas & Electric Corporation, after considerable investigation, came to the conclusion that in its case the sand blast is the most effective means of cleaning pipe under prevailing conditions. Experimentation proved that the surfaces resulting from this method are entirely cleaned and satisfactory for the purpose of making a good priming bond between the surface of the pipe and the primer coat.

The first experiment was made in the field on an 8-inch line about 6,000 feet in length. The line was laid in a territory where the soil is highly corrosive, and was just ten years old when leakage was found to such an extent that it was decided to recondition the entire line. A Pangborn sand blast was purchased and mounted on an Ingersoll-Rand portable compressor. Lapis No. 4 sand was used as a cutting medium. The Pangborn sand blast was known as an AU-I Hose Sand Blast, with a closed hopper suitable for operation from 60 to 100 pounds air pressure per square inch. The hose was 1 inch and the orifice 1-4 inch. The container of the sand blast had a capacity of 700 pounds of sand. The compresser was of the I-R Imperial Type No. 14, size 6x6, with a capacity of 118 cubic feet of free air per minute at 100 pounds per square inch.

The pipe was uncovered, cut in sections, and raised to a position at the top of the trench, restnig on skids. The blasting equipment was moved along outside the soil pile on the street side, and the operator worked on the clear side of the trench. His method of operation was to blast the upper half of the surface of the pipe as far in both directions as the hose would reach and then the pipe was turned and the process repeated, thus completely cleaning the pipe within the range of the hose.

Following this method, the maximum output for one day of eight hours, with a crew of three men and one foreman, was about 600 linear feet, which, on this size pipe, is equivalent to 1,350 square feet of surface blasted.

The results obtained on this particular job were so satisfactory that a second job involving about 2,500 feet of 20-inch pipe was attempted. This pipe had been in storage at our general storehouse for about three years, and was completely coated with a light coating of iron oxide. The portable sand blast was attached to the air system in the store-yard, and at first some difficulty was experienced with excess moisture from the air, but after experimenting with a few different types of air cleaners, this difficulty was overcome. Costs were not kept on this job, but the results were so satisfactory from a practical point of view that it was decided to experiment further and perform a complete test in order to determine the exact cost.

As a result of a very extreme condition of traffic congestion, Los Angeles and neighboring cities have gone into a rather extensive program of street improvements. Each one of these street improvements necessitates the rehabilitation of the mains, and in many cases it was found to be cheaper to remove the existing main and lay a new one, thus being certain that for a fair number of years there should be no reason to break the newly laid pavement.

A large quantity of used pipe accumulated at the store-room, possibly 50,000 linear feet, ranging in size from 3-inch to 8-inch, inclusive. As large a quantity of pipe as this demanded production methods. About ten length of pipe of the same size were laid alongside each other on skids and were blasted on the upper surface. They were then turned and the upper surface again blasted. To cover the full surface of the pipe three position were necessary. These lengths were then inspected by the man in charge and were rolled down the skids to some distance away from the scene of operation. The jarring which occurred during this rolling was found to be sufficiently strong to knock off all dust which had remained on the surface. The cleaned lengths were then primed to prevent the very rapid oxidation which would naturally occur on such a clean surface.

When the sand blasting process was first started it was the practice to relieve the nozzle man every half hour, but it was found that production was not up to expectation. This was later changed and the nozzleman was not relieved until he had finished ten lengths. Improvement was almost immediately noticed, for the nozzleman would speed up his work in order to get to his rest period. When a new nozzleman was put on, it was his general tendency to hold the nozzle too close to the pipe, so that the area of impingement was too small. The correct method of operating the nozzle is to hold it back about 18 inches and hose it back and forth with a motion similar to that used when sprinkling.

In the sand which was used at first, (designated hereafter as "Sand A"), the particles were more or less spherical and it was found that they somewhat retarded the speed of blasting. Experiments were then made with a crushed silicon sand "(Sand B"), its particles being more or less prismatic, with sharp edges. There was a noticeable difference in the speed of the work when this

* Read before the Technical Section, Pacific Coast Gas Association, at Southern Regional Conference.

by Sand Blasting

sand was adopted. A third sand was also used, ("Sand C"), the results obtained being practically identical with those of the second. One of these sands could be purchased at a price slightly to our advantage, and this was the sand adopted.

Due to the fact that we were blasting in the open with the pipe lying on skids very close to the ground, there was no opportunity to make either a whole or partial recovery of the sand. However, we intend to go into this feature more extensively, and are at the present time studying various types of equipment by means of which sand may be recovered. It is our understanding from companies handling these products that some of these sands can be used as many as five times, which, of course, will greatly reduce the cost per square foot.

The screen test and chemical analysis of the three sands are added as addenda to this paper.

After our organization was established, we were able to sand blast 2000 feet of 4-inch pipe per day, or 1600 feet of 6-inch pipe and in one case 300 feet of 20-inch pipe in one day. It is my belief that a production as great as this demonstrates that this process is not a slow one, as has been the general opinion. In any event the accumulated pipe was so rapidly reduced that we were satisfied for our purposes.

In securing the following figures relative to the cost, we accurately measured ten lengths of 4-inch pipe and rolled them into position on the skids. The hopper of the sand blast equipment was then filled with a known weight of "Sand B," and an orifice meter was arranged to accurately measure the quantity of air used. A record was also kept of the time consumed. This same procedure was repeated with a quantity of 6-inch pipe, selected by measurement to give practically the same square footage surface; then repeated again for 10-inch pipe, and still again for 16-inch pipe. The results were as follows:

ABOVE: Operator sand blasting a pipe line which is "fresh from the ditch," preparatory to rewrapping and painting; after this reconditioning line will be returned to service at same location.

BELOW: Salvaging pipe by use of sand blast. Operator is working on used pipe stacked on skids in gas company's pipe yards.

ABOVE: Compressor supplying air for sand blasting on job. Unit is Ingersoll-Rand Imperial Type No. 14, size 6x6.

SAND USED PER SQUARE FOOT

Size of Pipe	*Kind of Sand*	*Weight Per Square Foot*
4"	Sand C	2.49 lbs.
6"	Sand C	2.21 lbs.
10"	Sand C	1.56 lbs.
16"	Sand C	0.896 lbs.
4"	Sand B	2.52 lbs.
6"	Sand B	2.26 lbs.
10"	Sand B	1.76 lbs.
16"	Sand B	1.08 lbs.

AMOUNT OF AIR REQUIRED

Size of Pipe	*Kind of Sand*	*Cu. Ft. of Air Per Square Foot*
4"	Sand C	26
6"	Sand C	15
10"	Sand C	5
16"	Sand C	4
4"	Sand B	16
6"	Sand B	15
10"	Sand B	6
16"	Sand B	5

COST OF SAND USED

The following table shows the cost per square foot, including the cost of installation, sand, power, labor, and supervision:

Size of Pipe	*Kind of Sand*	*Total Cost Per Square Foot*
4"	Sand C	$ 0.02344
6"	Sand C	0.01504
10"	Sand C	0.01335
16"	Sand C	0.00869
4"	Sand B	0.01890
6"	Sand B	0.01550
10"	Sand B	0.01352
16"	Sand B	0.00937

From the quantity of sand used per square foot of surface it was observed that the unit quantity of sand became greater as the diameter of the pipe decreased. It was found that a definite relation existed between the quantity of sand used per square foot and the curvature of the surface blasted. This observation was so very interesting that a curve was plotted, which is reproduced with the present paper. By means of this curve the quantity of sand per square foot for any diameter of pipe may be determined.

A GOOD INVESTMENT

When we stop to consider that 3-inch plain end pipe costs about 30c per linear foot, 4-inch about 48c, 6-inch about 85c, and the larger sizes increasing in proportion, it is not difficult, nor inconsistent, to decide that a further expenditure of 2c per linear foot for cleaning is good engineering and good business. The surface obtained is as clean and perfect, we believe, as it is humanly possible to get it,—and as has been stated before, and is repeated here again for emphasis, a clean surface on the pipe insures a good priming bond. This, in turn, insures good wrapping. The whole sum and substance of pipe protection is that pipe can not corrode if moisture is kept from it, and the sand blast, in our experience, makes an important contribution to the technique which will effect this desired condition.

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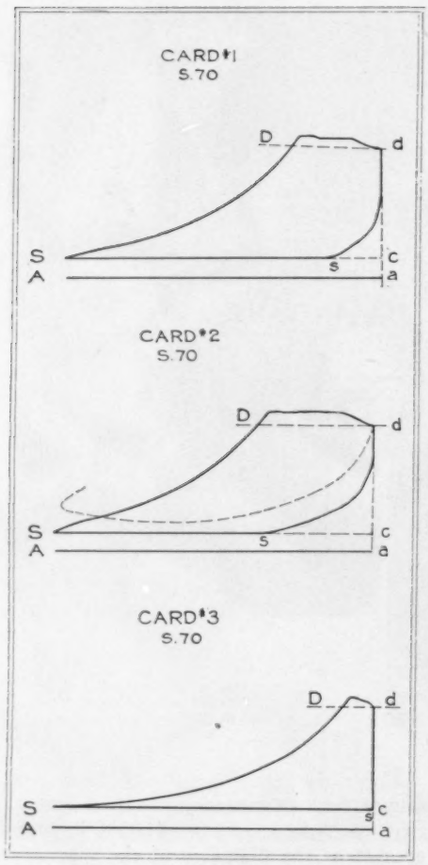

Practical Use *of the* Indicator *in* Gas Compressor *and* Gas Engine Work

By ELTING HENDERSON
Southern California Gas Company

DURING THE coming July the author of this discussion will pass his twentieth milestone of service in the gas industry, and he speaks from a varied background of experience in gas transmission and compression problems, both in Mid-Continent and California fields. Mr. Henderson is Superintendent of the Southern California Gas Company's Southern Division.

Use of the indicator in gas compressor work is treated in the present article, and an early issue of *Western Gas* will carry the second installment, on indicator use in gas engine operation.—*Editor.*

THE use of the indicator in engine practice dates back to the time of James Watt, inventor of the condensing steam engine, and also probably the inventor of the indicator. It was used by him and his business partner to determine the work done by the engines they manufactured and sold, the basis of the charges levied being arrived at from the indicator diagram. Since the time of Watt the engineering profession has generally recognized that the indicator is indispensible in engine operation and its usage is taught and stressed in practically all courses of study pertaining to engines. However, all compressor operators have not had the advantage of such courses of study and it is hoped that they will find the following of benefit:

While the indicator diagram is necessary for accurately determining horse power in the cylinder it is probably of more value to the operator in indicating the timing of the events and the mechanical condition of the interior of the engine or compressor.

The diagram will be more easily understood if it is known that there is nothing mysterious about the indicator or the markings on the card. The distance of the pencil or marker above or below the straight horizontal atmospheric pressure line represents the pressure in the cylinder at all positions of the engine piston travel and is obtained by moving the card, which is attached to the indicator drum, in unison with the piston of the engine while the pencil moves away from the atmospheric line as the indicator piston is acted upon by the pressure in the cylinder. Also the cylinder pressure at any point of the stroke may be obtained by measuring the vertical distance between the atmospheric line and the mark made by the indicator pencil since the pencil moves one inch per unit marking of the spring. For instance, if the pencil marking is one inch above the atmospheric pressure line and the indicator spring marking is 100 pounds per square inch then the cylinder pressure at that point is 100 pounds; likewise if the pencil marking is 1/16 inch below the atmospheric pressure line at a given point, then the cylinder pressure at that point of the stroke is 1/16 of 100 or 6¼ pounds per square inch below atmospheric pressure. Before going on to card illustrations mention should be made of the importance of using a spring that will give a sufficiently large diagram. The pencil travel is usually about 2¼ inches, so for pressures of 125 pounds a 50 or 60 pound spring should be used which will give a diagram about 2 inches in height. For low pressure a correspondingly low pressure spring should be used, the object being to make the diagram as large as possible. It is obvious that a 200 pound spring for say, 30 pounds pressure would be useless since the height of the diagram would be only .15 inches above the atmospheric line and a variation of 15 pounds would cause a difference in height of the diagram of only .075 inches.

For purposes of this discussion atmospheric line will be designated A-a,, intake line S-s, and discharge line D-d.

Card No. 1 is a normal compressor card showing no apparent leakage. The intake line being 7/32 inches above the atmospheric line and a 70 pound spring being used, gives the intake pressure as 7/32x70=15+pounds. The discharge line as measured at d-a shows a distance of 1-7/16 inches which, multiplied by 70 gives the discharge pressure as 100+ pounds. The portion of the diagram above the dotted line at d is lost work and cannot be entirely eliminated. It may be caused by the inertia of the discharge valves and springs or a wire drawing effect through the valves or excessively wide valve seats or too heavy valve springs, or a combination of one or more of these causes. If this area increases during normal operation it will probably be found that the discharge valves are becoming clogged by dirt or carbon.

The line from d to s is formed during that portion of the cycle at the beginning of the intake stroke, when the gas left in the clearance space is expanding to the intake pressure. The distance from s to c represents that portion of the intake stroke in which no gas is admitted. It varies directly with the ratio of compression and is not uniform in different makes or sizes of compressors because the clearance volume is not the same for all makes and sizes; therefore it must not be assured that the performance is not satisfactory when line s-c is shorter or longer than on a card taken under known satisfactory conditions. This distance will, however, become greater if a discharge valve is leaking as shown in Card No. 2. It is occasioned by the fact that gas is passing into the clearance space through the discharge valves and maintaining the pressure in the cylinder higher than the intake pressure until the increased speed of the piston as it approaches mid-stroke creates volume or cylinder space more rapidly than the leaky valve

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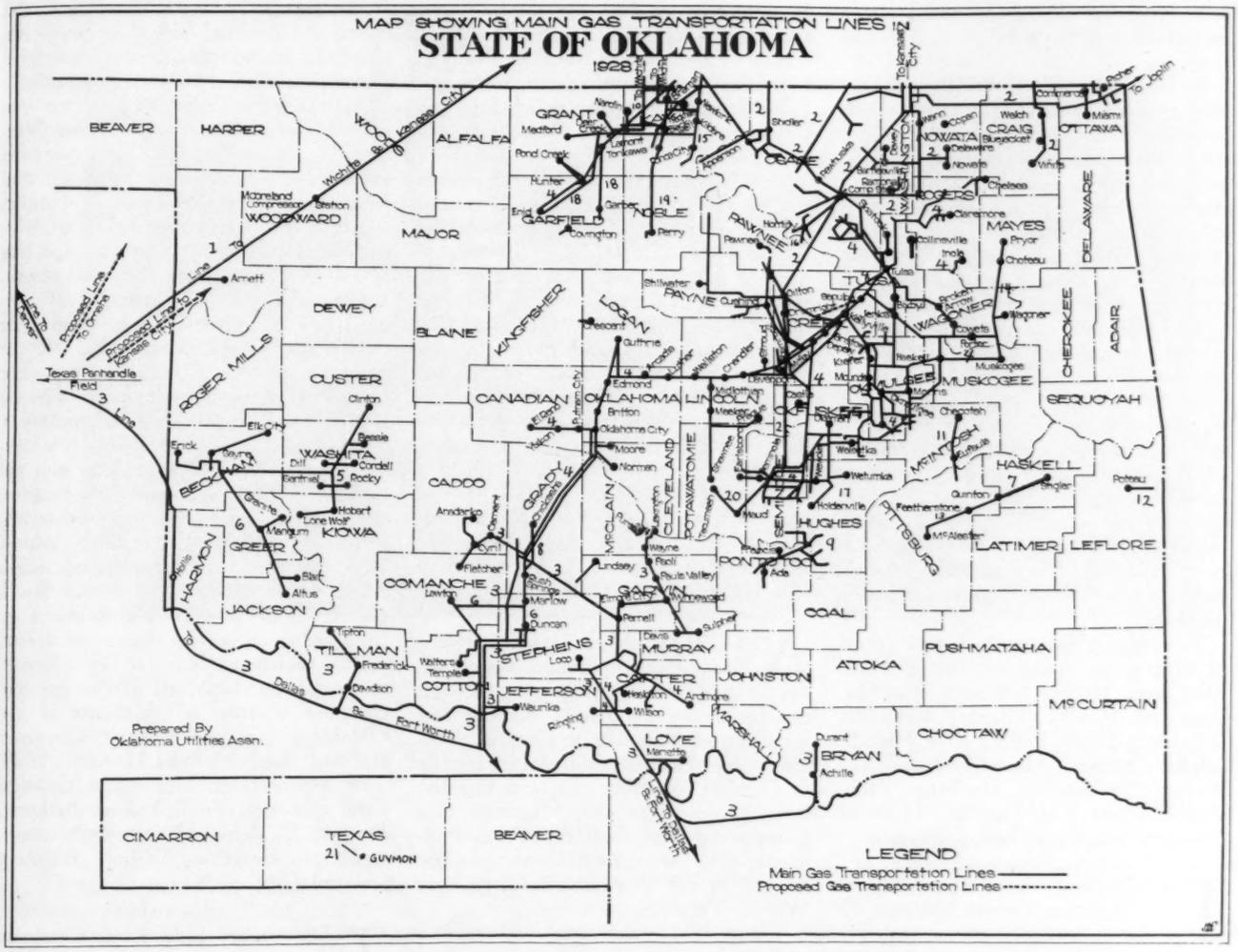

1927-1928 Gas Progress *in* Oklahoma

By O. D. Hall
Assistant Manager
Oklahoma Utilities Association

OKLAHOMA holds a leading place in the production, transportation and distribution of natural gas. Because of the abundance of this fuel no gas is manufactured in the state. The last manufactured gas plant disappeared in 1922.

Oklahoma led all other states in 1926 with a natural gas production of 286,677,000,000 cubic feet. Almost 18 per cent of the entire natural gas output of the nation comes from Oklahoma wells, according to latest available statistics.

There are approximately 7,250 miles of gas pipe lines in Oklahoma, ranging from four to 22 inches in diameter. This does not include many thousands of miles of gathering and distribution lines. More than 550 miles of gas transportation lines were constructed in 1927, and during the first three months of this year, according to figures compiled by the Oklahoma Utilities Association. Approximately 250 cities and towns of Oklahoma now have natural gas distribution systems and many more have good prospects of securing such service.

But a few years ago the extensive territory west of Lawton, El Reno and Enid was without gas lines. This lack of the magic fuel, taken in connection with a shortage of railway lines and a shortage of central station light and power service, tended to retard development of Western Oklahoma. The coming of the gas and electric lines and extension of railroad and motor bus service however, have brought about a wonderful transformation in what a few years ago was commonly known as the "short grass country." It is now vieing with the older and more populous section of the state in rapid growth and prosperity.

Discovery of natural gas in commercial quantities in Beckham and other western Oklahoma counties, and later in the great Texas Panhandle area just a few miles farther west, has brought natural gas to 25 towns in that section of Oklahoma and immediate prospects of securing this cheap and convenient fuel to as many more municipalities. The coming of gas has already stimulated the establishment of industries in Western Oklahoma and has created a lively hope of soon becoming an important

manufacturing region as well as a section blessed with broad and fertile acres.

Eastern and central Oklahoma have long enjoyed natural gas facilities because the first oil and gas fields in the state were discovered there. Yet in those sections there remain a number of smaller towns which have aspirations to secure gas service. In fact the gas franchise activity of the past year has been about equally divided between eastern and western Oklahoma.

There is more activity in natural gas extension than ever before in the history of the state. During the first three and one-half months of the present year 11 gas franchises have been granted, half as many as during the whole of 1927. Towns granting gas franchises since January 1, 1928 are: Texhoma, Carnegie, Fort Gibson, Kingfisher, Hennessey, McLoud, Tahlequah, Sasakwa, Wyanoka, Konawa and Shattuck. Several more have called franchise elections.

Twenty-two Oklahoma towns granted natural gas franchises during 1927. They are: Hollis, Fletcher, Waurika, Cromwell, Coyle, Prague, Eldorado, Grandfield, Davis, Pauls Valley, Purcell, Sulphur, Stigler, Marietta, Lexington, Wayne, Indianola, Hooker, Paoli, Elgin, Arnett and Lovell. Most of these are already receiving service.

THE Texas Panhandle gas field was the "lodestone" which last year attracted the construction of two big gas pipe lines passing through portions of Oklahoma, the beginning of another to Denver, which however does not touch Oklahoma soil, and surveys on two proposed lines. The Cities Service Gas company, representing Doherty interests, completed a 267-mile 20-inch line from Pampa, Texas to Wichita, Kansas and now announces a proposed extension of this line from Wichita to Kansas City. This line was completed in December of last year and cost more than $15,000,000. At the opening of the line more than 400,000,000 cubic feet of gas daily were made available for communities in Oklahoma, Kansas and Misouri served by the Cities Service Gas Company or utilities purchasing gas wholesale from this concern. One of the three huge compressor stations on the line is located near Mooreland, Oklahoma. This line crosses diagonally the Oklahoma counties of Ellis, Woodward, Wood and Alfalfa, a total distance of about 125 miles.

A line connecting the Fort Worth and Dallas pipe line systems of the Lone Star Gas Company with the Texas Panhandle field passes about 32 miles through the extreme western portion of Harmon county and the southwestern section of Beckham county, in Oklahoma. This line also connects with the main gas transportation system of the Lone Star gas company which taps the Chickasha and other Oklahoma gas fields and which carries gas to Fort Worth, Dallas and many other Texas towns. The Knorpp interests announce a proposed 22-inch line from the Texas Panhandle fields to Kansas City to pass through northwestern Oklahoma not far from the Cities Service Gas Company line. The Winchester Oil and Gas Company which proposes to procure its supply from this line if constructed, has secured franchises or has franchise elections set in several towns of Oklahoma. The United Gas Service Company, headed by C. E. Burlingame of Bartlesville, Okla., has also secured several franchises in Oklahoma and Kansas and will obtain the gas supply from the Pampa-Wichita line of the Cities Service Gas Company.

ANOTHER big gas line tapping the Texas Panhandle field is proposed by the Skelly interests to run through the Oklahoma Panhandle, Kansas, and a portion of Nebraska to Omaha. This line is dependent on securing a franchise in Omaha. Another proposed line has been surveyed by the Magnolia Gas Company to run from the Texas Panhandle field through Oklahoma, possibly by way of the Chickasha field, to Fort Worth, Texas.

There was much gas construction activity during the past year which did not have the Texas fields for its objective. The Lone Star Gas Company expended more than $1,000,000 constructing a 16-inch line about 40 miles long from near Pernell, Oklahoma, to the Chickasha gas field, tying into its Oklahoma and Texas systems. It also constructed a transportation line to Sulphur, Davis, Purcell, Wynnewood, Lexington, Elmore City, Wayne and Paoli to supply gas to the Community Natural Gas Company, a Lone Star subsidiary, which is distributing gas in those towns. Lines were also constructed by the Lone Star to Tipton, Marietta, Waurika and other Oklahoma towns which the Community Natural is serving. More than 100 miles of new pipe line, exclusive of distribution mileage were required, to make these connections.

The Doherty interests also carried on a heavy construction program in addition to the Pampa-Wichita line of the Cities Service Gas company. About 40 miles of gathering and transportation lines were constructed in the Bearden and Earlsboro pools of the Seminole and Okfuskee county fields, connecting with the company's system at Okemah. Also about 26 miles of pipe line was constructed connecting the Drumright-Davenport line with this production.

An extensive expansion program was also carried on by the Oklahoma Natural Gas Corporation. The company extended several transportation and feeder lines from the Seminole, Hughes county, and Chickasha fields to give additional reserve supply to its pipe line system carrying gas to about 70 towns. It also constructed 35-miles of 16-inch pipe line from the Norge compressor station in the Chickasha field to the South Canadian River crossing near Oklahoma City, paralleling a 12-inch line which was already in operation. This gives the company double line connection between Oklahoma City and the Chickasha field and gives the capital city about three times the supply that was formerly available from that source. The company also constructed additional river crossings over the South Canadian to protect Oklahoma City from failure of service because of floods.

The Oklahoma Natural Gas Corporation also purchased all of the gas distribution systems in Oklahoma of the Oklahoma Gas and Electric Company and took charge of these March 1, 1928. The systems taken over are: Oklahoma City, Shawnee, Enid, Yukon, Bethany, Britton, El Reno, Muskogee, Norman, Ardmore, Healdton, Wilson, Ringling and Oil City.

THE Allen Pipe Line Company constructed a 12-inch line from the Allen field to Ada, which supplies gas to Francis, to the Southwest Gas Company at Ada, and to the Byng Power station of the Oklahoma Gas and Electric Company, the Ada Portland Cement Company, and other industries near Ada. This line is about 25 miles long and is connected to wells with a daily capacity of about 50,000,000 cubic feet.

A gas pipe line extending from the Cain field 16 miles into Muskogee has been laid by the Municipal Gas Company. This connects with a city-owned line and serves one of the municipal enterprises of Muskogee.

Kansas secured another connection with Oklahoma gas wells when the Farout Oil Company laid 30 miles of line to Parsons, Kansas to supply the M.K.&T. Railroad Shops there.

A duplicate 6-inch line was laid by the Southwestern Light and Power Company giving its gas distribution system at Chickasha another connection to the Chickasha field. The company also built a new 10-inch line from the Chickasha field to Duncan, Marlow and

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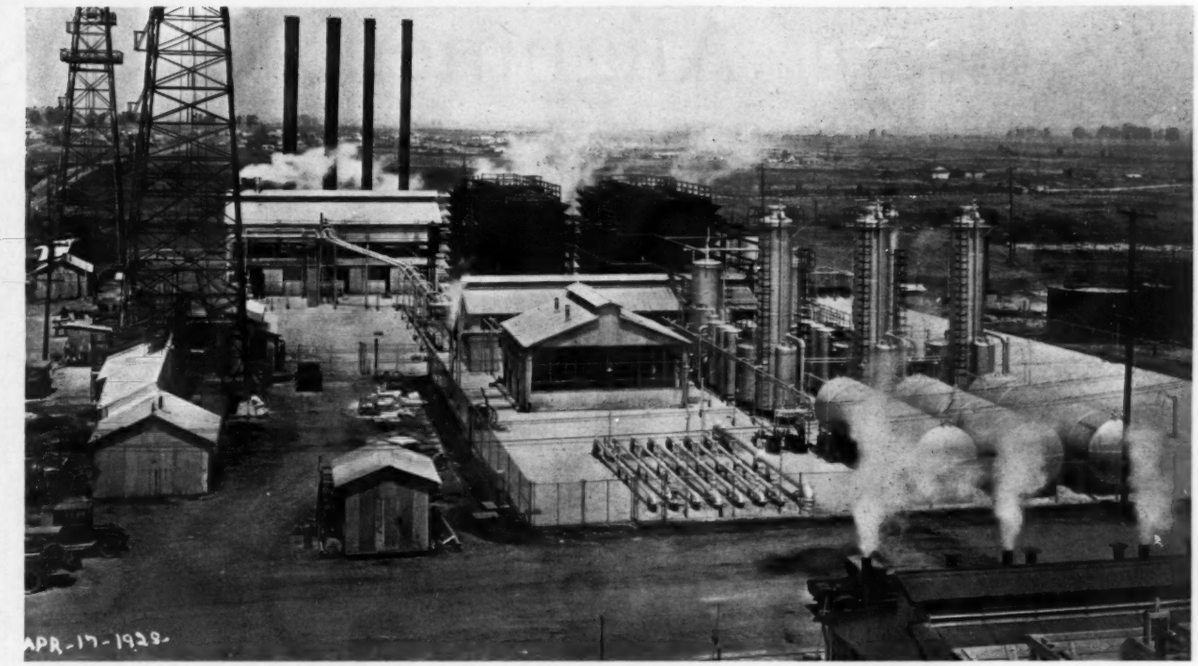

Birds-eye view of Plant No. 5, Signal Hill field. End of compressor plant is shown in foreground. Note also the meter manifold, at left just inside plant enclosure

California Gasoline Company's Plant No. 5

By H. S. COLE, JR.
Chief Engineer
California Gasoline Company

THE California Gasoline Company, a subsidiary of the California Petroleum Corporation, has recently completed its Plant No. 5, so numbered to fill in the numerical series —taking the place of a plant which was dismantled some years ago. It was installed at Signal Hill to handle the deep sand gas which is now beginning to come in, and is the last constructed of 13 absorption plants being operated by this company in California.

The capacity of the plant is 25,000,000 cubic feet of gas and 60,000 gallons of gasoline per day. The gas being treated is furnished by two booster plants and the excess gas from several of the company's absorption plants. This new plant was so located that when the peak gas production is over, the older, more obsolete absorption plants may be shut down and all the gas in the district can be treated in Plant No. 5 as a central absorption plant. The older plants will then function as booster plants.

In the design of Plant No. 5 considerable thought was given to future expansion and contraction of capacity. It was, therefore, built in two separate units, operating in parallel and with provisions made for additional units to be added later without interruption of operation. The site will accommodate

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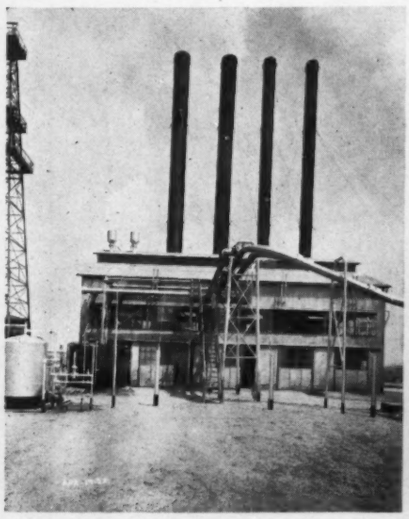
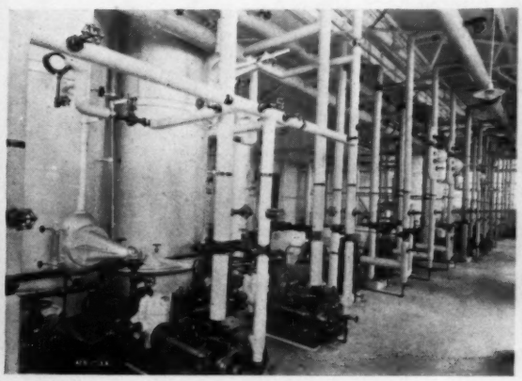
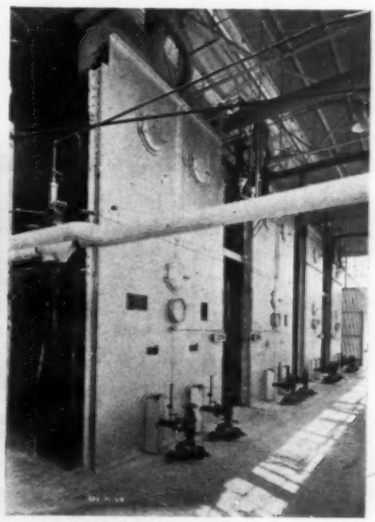


LEFT: Outside view of boiler plant. CENTER: Inside view of pump house. RIGHT: Interior of boiler plant, showing boiler fronts. Two 250-H.P. and two 157-H.P. boilers at rated horsepower make up the installation. Boilers can work at 200 per cent of rating.





The Use *of* Alignment Charts *for* Pressure Extensions

By THOMAS T. GILL

Union Oil Company of California

FOLLOWING HIS discussion of alignment charts before the Southern California Meter Association, on March 22nd, Mr. Gill was asked to amplify his remarks for publication in *Western Gas*. We present herewith his concise description of alignment chart use, together with typical charts prepared by the author.—*Editor.*

RECENT proposals for the adoption of a standard cubic foot for the measurement of gas at 14.73 pounds per square inch absolute have brought up several practical difficulties in gas measurement, and have likewise caused the meterman to re-examine the methods of computation now in use.

The fundamental gas measurement formula for orifice meters may be expressed as

$$Q = C\sqrt{h\,P}$$

where

Q=cubic feet of gas at standard pressure and temperature

C=coefficient depending on orifice and pipe size

h=differential pressure drop across orifice in inches of water

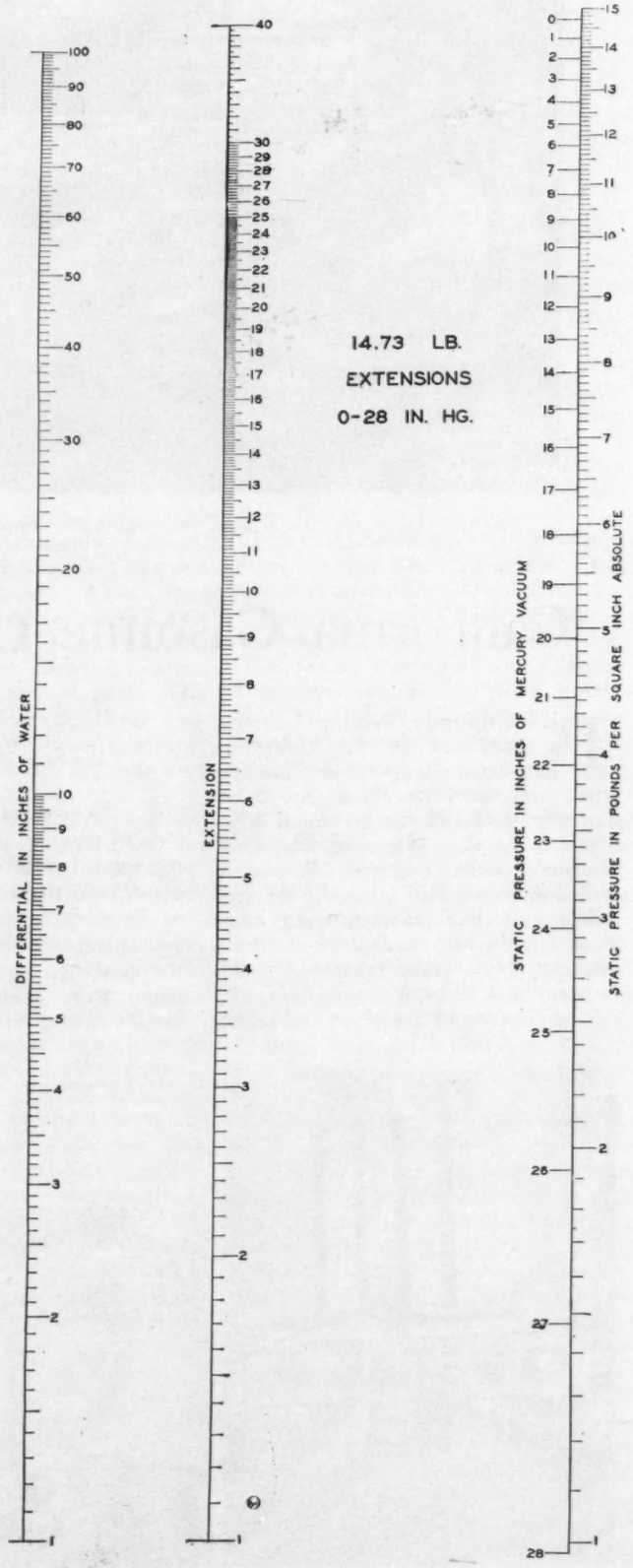
P=static pressure in pounds per square inch absolute

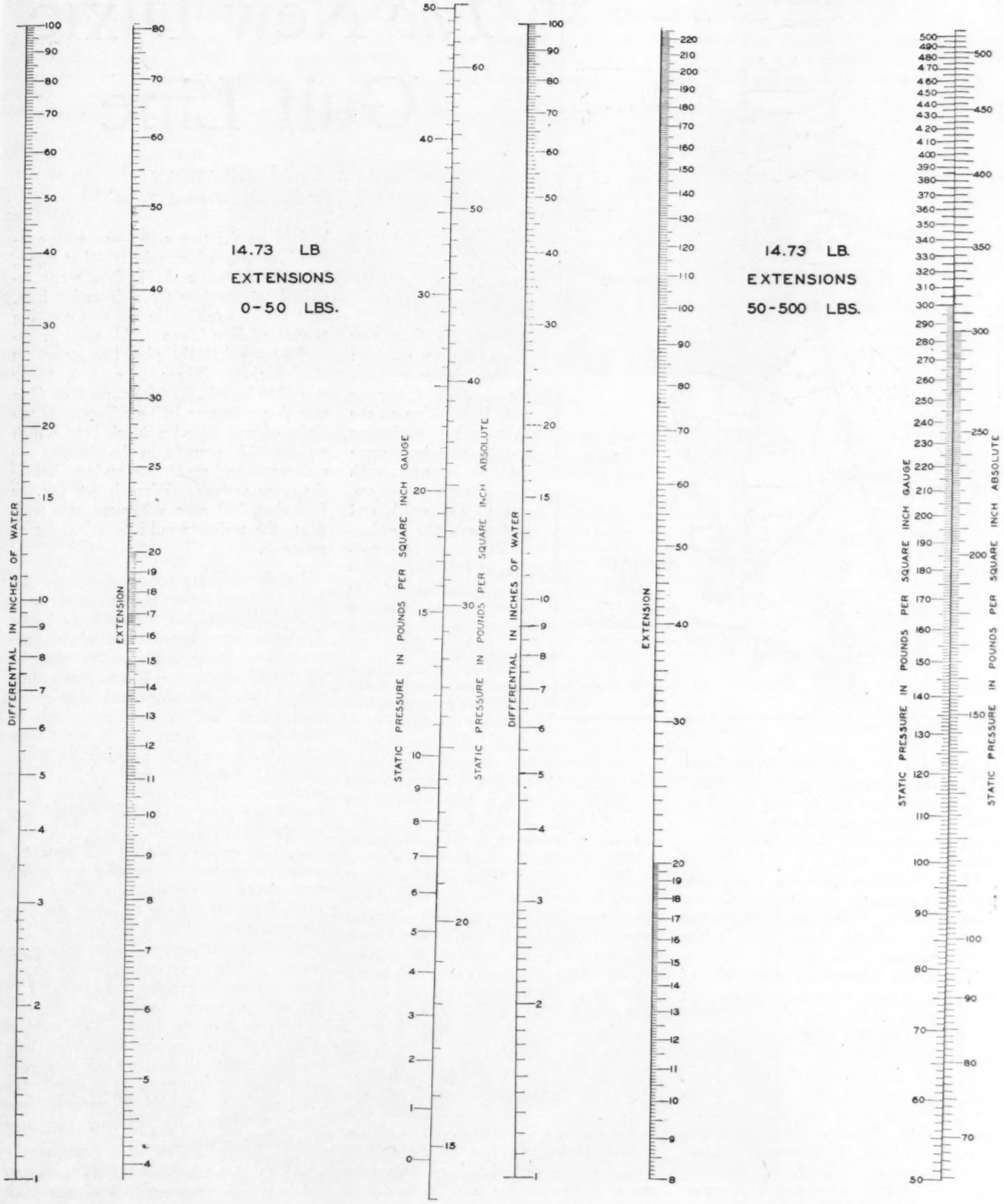
The term $\sqrt{h\,P}$ is known as the extension and is usually obtained from a set of extension tables. The only book of pressure extensions available at present is based on 14.4 pounds per square inch. The use of the 14.73 pound base carries with it a system of zones, depending on the height of the meter above sea level, so that extension tables are needed for every zone in which gas is measured. But the preparation of 10 to 20 such tables would be out of the question, and the setting of the static pressure pen to compensate for the difference between 14.73 and the local barometric pressure also has its disadvantages.

Other alternatives are the use of the slide rule and the alignment chart. While the special slide rule is relatively expensive, the alignment chart can be printed very cheaply and replaced when it is worn or soiled.

The accompanying charts are based on 14.73 pounds per square inch absolute and can be used for gas measured at sea level. They were prepared primarily to allow metermen to test their accuracy and become familiar with their use. If they are found satisfactory, they can easily be made for the various pressure zones to be determined by the meter associations.

To use the charts, draw a straight line from the differential on the left hand scale to the pressure on the right hand scale, and read off the extension on the middle scale. The charts give the extension to approximately three significant figures, which is all that the accuracy of the pressure and differential readings warrant.

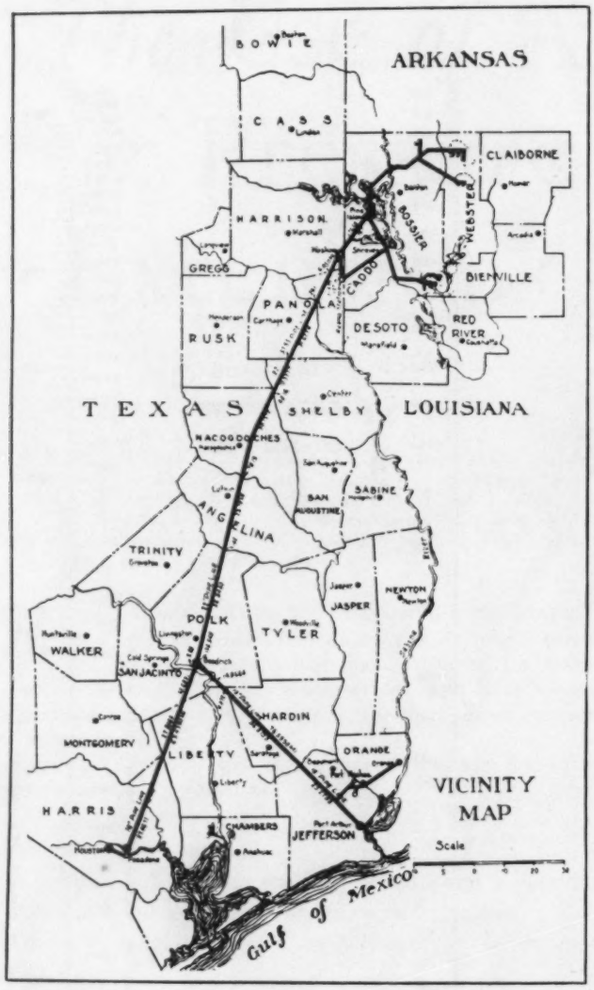




THESE ALIGNMENT CHARTS AND THE ONE ON THE PAGE OPPOSITE ARE FOR USE IN CALCULATING PRESSURE EXTENSIONS IN THE MEASUREMENT OF GAS AT SEA LEVEL. DIFFERENT SETS OF ALIGNMENT CHARTS CAN READILY BE MADE FOR METERING STATIONS HAVING OTHER ELEVATIONS.

The New Dixie Gulf Line

By A. E. McKiearnan
Dixie Gulf Gas Company, Houston, Texas



Tracing the route of the Dixie Gulf Gas Company's large carrier, laid in 1927 and 1928

EARLY in 1928 the Dixie Gulf Gas Company saw the final touches put to its new transmission line bringing gas almost 300 miles from Louisiana and Texas fields to the Gulf Coast.

Dixie Gulf Gas Company is a transportation company, the Dixie Gas and Fuel Company being the distributing company, both of them Moody-Seagraves projects.

The Dixie Gulf Line was built to serve the Texas Company refinery at Port Arthur, the Pure Oil Company refinery at Smith's Bluff, supply from 10 to 30 million feet to the Houston Gulf Gas Company (as the Houston line is overloaded) and also to supply the following cities and towns: Beaumont, Port Arthur, Orange, Tyler, Longview, Rusk, Henderson, Jacksonville, Palestine, Carthage, Timpson, Garrison, Nacogdoches and Livingston.

Gas is obtained from the Bethany, Waskom, Cotton Valley, Carterville, Greenwood, Elm Grove, Serapta and Shangaloo Fields, in Louisiana and Texas. Six of these fields have more than one producing sand.

Moody - Seagraves interests own one-half of the Reserve Natural Gas Company and, in addition to the vast new gathering system, two lines were laid to connect with the Reserve system, one to the north end and one to the south.

The main line consists of 138 miles of 22-inch, 77 miles of 18-inch and 65 miles of 16-inch and one mile of 14-inch pipe. In addition, the Dixie Gas and Fuel Company has many miles of tap lines consisting of 4, 6, 8, and 10-inch pipe.

The 22-inch line extends from Waskom, Texas to Goodrich, Texas. From Goodrich an 18-inch line extends to Port Arthur. Near Beaumont a 16-inch line was laid to Smith's Bluff and a 14-inch extension reaches Port Neches. Fourteen miles of 8-inch line, which is owned by the Dixie Gas and Fuel Company, was laid through the alligator swamps to Orange, Texas. From Goodrich, a 16-inch line was laid to a point on the Ship Channel near Houston, where a connection was made for delivery to the Houston Gulf Gas Company.

A contract for the construction of the Dixie line was given to the Hope Engineering and Supply Company of Mt. Vernon, Ohio, and it is believed that something of a construction record was made, as the entire line was built in 94 days. The work would have been completed in 80 days but many rains during the latter part of the construction period delayed the progress. For example, a crew was started at each end of the 18-inch line and near the center they met. With the ditching machines finished and only one and a half miles remaining to be laid by the two crews—an easy one-day job—a five-inch rain fell that night, in seven hours, and 17 days were required to complete the mile and a half, both crews working in the swampy, big thicket of East Texas. All sorts of experiences befell the pipe line crews in this thicket. There is even a "bear story" to be told in this connection. One morning a farmer living adjacent to the right of way killed a black bear which weighed 420 pounds, in the clearing the contractor had made, just an hour before the crew arrived. Were it not for the fact that 200 men witnessed this incident, the writer would be reluctant to relate it.

Briefly touching upon some of the details of construction and materials used in the Dixie project, it may be said that five crews were kept on the job, the average total being 1400 men per day, or 280 men per crew. Three crews used two ditching machines and two crews used three ditching machines. All of these machines were run in eight-hour shifts but were kept running 24 hours per day. Each crew used a back filling machine, with the boom shortened to handle the pipe, as each joint of 22-inch weighed 2100 pounds. Each crew also used four tractors, with winch attached, and a boom with a movable leg which was placed on the opposite side of the ditch from the tractor to lower the pipe into the ditch. This is the best plan the writer has ever seen as no horses are required and the pipe can be lowered very slowly, thereby keeping the same degree of bend in each coupling as the line is lowered into the ditch. This method also eliminates the use of a lever pole and horse and 15 men. Each crew also used three or four tractors to handle the back-fill. A total of 56 tractors was used, excluding the ditching and pipe handling machines.

With the exception of 44 miles of 16-inch pipe, the entire line was constructed with the new electric welded pipe, which is all of uniform 30-foot lengths. Each joint was tested at the mill and a 400-pound test after the line was completed failed to open a seam. This item, together with the fact that

not one case of coupling trouble developed, is very remarkable as the test was extremely high considering the size of the line.

A train load of pipe left the factory each day, which gave us a four-day delivery, and, in one or two cases pipe was received on the siding in Texas which had left the factory 72 hours before. This recalls an incident which happened in North Texas. A much perturbed agent called one morning by telephone and stated that he had 39 cars consigned to a certain switch which held only three cars. The same day in the afternoon he called again and stated that he had 59 cars for another switch which would hold only four cars. The next day he received 90 cars for his own station and an embargo was immediately placed on all car load shipments in that vicinity. This congested condition was speedily relieved however, as the stringing contractors, were equipped to unload and string the pipe in record time.

The compressor station was also built by the Hope Engineering and Supply Company. Twenty-eight engines of 160 H. P. each were installed in the main building. The plant was designed for three suction pressures; all are single stage and all suctions may be used at the same time. Eight of the compressors may be used on either suction, which allows a great flexibility. The auxiliary engines are two 160 H. P. Hope direct connected to 440 A.C. Generators and one 250 H.P. Hope direct connected to a 440 A.C. Generator. All water and oil pumps are motor driven as are all air compressors. Water for the station is obtained from wells, but an emergency supply is provided by an artificial lake which covers 25 acres. Employees and their families are made comfortable in company bungalows. These bungalows have five rooms with bath, breakfast room and sleeping porch, and are modern in every way.

The gasoline plant is located on the same site, but 500 feet away from the main line and compressor station. This plant was built by the C. F. Braun Company and is entirely motor driven. This fact of course reduced the initial cost of installation, but a great benefit is also derived from the more regular operation of a motor driven plant. The 250 H. P. engine which furnishes the power for the gasoline plant is located in the auxiliary room of the compressor station and therefore requires no extra men to operate it. The gasoline plant has a capacity of 90 to 100 million feet of gas and 20,000 gallons of gasoline per day. A new record was made by the C. F. Braun Company in gasoline plant construction. Contract for construction was awarded about December 1st and construction started early in December. The plant was ready to operate January 7th and completed February 1st.

Pulling pipe-laden flatboats into the marsh by cable

Swamp Lands Make Hard Going *for* Line Crews

By HORACE CULPEPER, *Vice-President*
Engineering Service Corporation, Houston, Texas

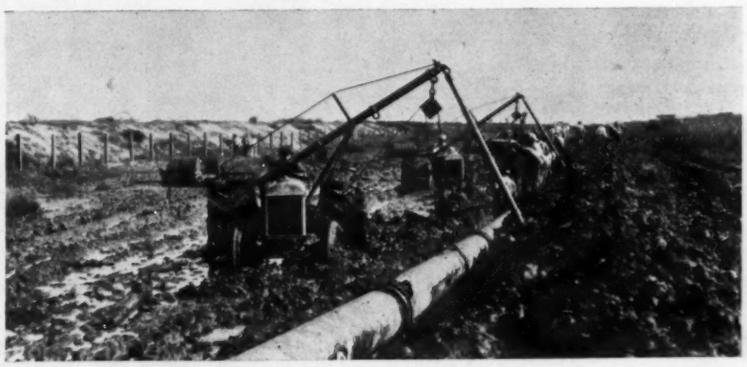
ONE of the many individual problems which confronted the engineers who constructed the Dixie Gulf Gas Line entailed the laying of an eight-inch high pressure line across more than three miles of swamp land between the east bank of the Neches River and Orange Texas.

To be exact, the distance across the swamp of water, mud and tall sage grass was 18,082.5 feet. The water level over this marsh during the winter months is entirely controlled by wind direction and freshets that come down the Neches River and other streams, and the depth varied to plus three feet. Soundings taken with a one-half inch pipe every 200 feet along the survey line showed that in some instances no true bottom was reached before a depth of 20 feet. Running through this swamp was Burr Island Bayou which also had to be crossed.

The original method recommended for constructing the pipe line across the marsh was abandoned due to cost. By this method a piling trestle would have been constructed to carry the pipe line above high water mark. The final method of construction was to bury the line in a trench.

The swamp, as above indicated, was covered by a very heavy vegetation that grew considerably higher than a man's head. Because of this growth it was necessary to erect an elevated trestle for the instrument man surveying the right-of-way. Next in order was the clearing of the right-of-way, followed by the construction of a pipe welding rack 300 feet in length and approximately 20 feet in width.

This rack was the scene of much activity. It was here that the pipe was assembled and welded together in 300-feet lengths. The welding rack eliminated the necessity of the welders working the entire length of the marsh, which afforded a considerable *(Continued on Page 85)*



Tractors were used to lower Dixie line into trench

Five rivers, the Sabine, Angelina, Neches, Trinity and San Jacinto were crossed by the Dixie Line; also Green's Bayou which is 20 feet deep, and a large drain ditch near Beaumont. All seven of these crossings are manifold crossings. Five 10-inch lines were used on the 22-inch line; four 10-inch on the 18-inch line and four 8-inch on the 16-inch line. Several overhead crossings were made on piers across large drain ditches and fresh water canals. In all river bottoms, as far as overflow water reached, 10 joints were welded together and a long Dresser sleeve used for connecting. Enough cast iron weights were fastened to the line to overcome the buoyancy.

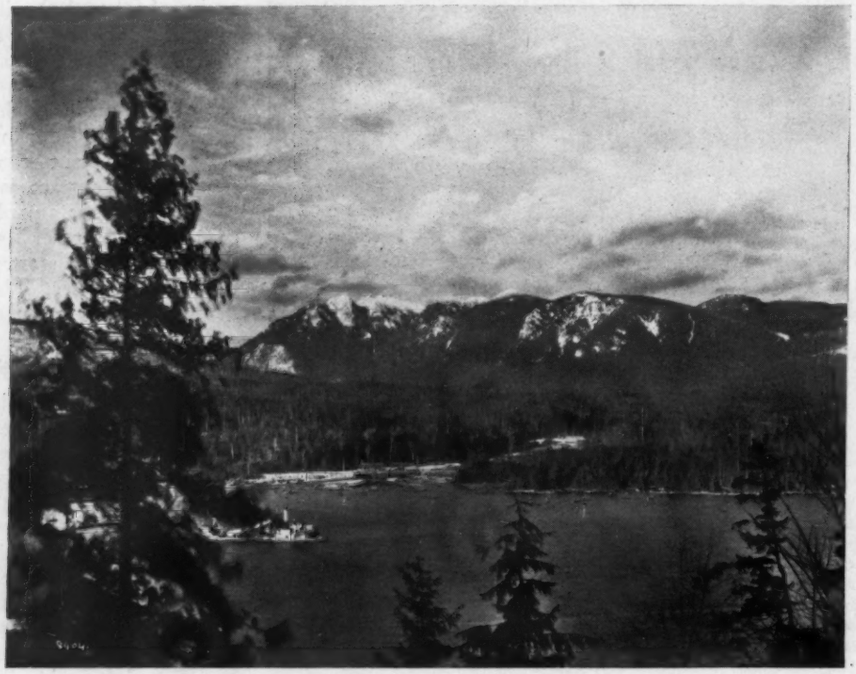
A telephone line of No. 9 copper was constructed from Waskom via Goodrich to Houston and another from Port Arthur via Goodrich to Houston. This system also connects with several of the large measuring stations.

The Dixie Line is now in operation with an average delivery of 55 million cubic feet daily. Its capacty without a compressor station on the main line is 80 million, but the contemplated *(Continued on Page 71)*

PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California

A Department Conducted by Clifford Johnstone, Executive Secretary



Entrance to Burrard Inlet, Vancouver, B. C.

Vancouver Is Next on P. C. G. A. Calendar

PLANS for the Northern Regional Conference in Vancouver, B. C., June 6th and 7th, are almost complete and programs will be mailed to all Association members about the middle of May. Meetings and banquet will be held at the Vancouver Hotel, and while this alone should be an inducement to attend, John Keillor and the other good gas men of the British Columbia Electric Railway Company, Ltd., promise that the entire program will not have a dry* moment in it.

Tentative details of the Vancouver program are given below:

WEDNESDAY, JUNE 6

10:00 A.M. Welcome to Vancouver by His Worship Mayor Taylor.

10:10 A.M. "Public Relations Through Service."
M. C. Hancock, Division Manager, Washington Gas & Electric Co., Aberdeen, Washington.

10:30 AM "Venting Appliances and the Necessity of Gas Companies Cooperating With City Building Inspectors Department."
Arthur J. Bird, City Architect and Building Inspector, Vancouver, B. C.

*Meaning tedious.

11:00 A.M. "Resurrection of the Vacuum Heating System."
F. H. Hewlings, Sales Mgr. Victoria Gas Company.
Robert Carver, Industrial Engineer, Vancouver Gas Co.
C. E. Alger, Vancouver Gas Company.

11:30 A.M. "Public Relations Through Employee Contacts."
C. E. Lasher, Division Manager, Washington Gas & Electric Co., Everett, Washington.

12:00. Adjournment.

2:00 P.M. "Experience With Continuous Vertical Retorts."
W. H. Dreaper, Plant Supt, Vancouver Gas Company.

2:30 P.M. "Public Relations Through Executive Policies."
James Lightbody, Advertising Manager, British Columbia Electric Power & Gas Co., Vancouver.

3:00 P.M. Question Box—High Bill Complaints.

3:30 P.M. Adjournment.

THURSDAY, JUNE 7

9:30 A.M. Question Box—Commercial and Technical.

1:30 P.M. Scenic drive to Grouse Mountain Chalet in B. C. Electric Co.'s stages.

6:30 P.M. Informal Get-Together Dinner at Vancouver Hotel.
Mr. George Kidd, President British Columbia Electric Power & Gas Co., Ltd., Speaker of the Evening.

Ask Me Another —at Vancouver

THERE has been such a wonderful response to our request for questions to be featured at the Vancouver Conference on June 6th and 7th, that we would despeir of securing answers if we were less familiar with the resourcefulness of Pacific Coast Gas men. The questions, however, offer a challenge to the Association membership, and just as our members in the Northwest have not hesitated to ask for some extremely pertinent information, so, we trust, the combined membership will not hesitate to contribute answers drawn from their knowledge and experience.

Questions to be answered are listed below, separated into Commercial, Technical and Public Relations. Furthermore they are numbered. We ask that each member or each reader of this page study these questions carefully and if he feels that he can contribute something to the solution of any or all of the problems presented in this list, that he sit down, write out his answer and send it post haste to the Secretary, and do this so that his contribution will be received not later than May 15th. We hope to have every question answered

TELL THIS TO YOUR SCOTCH FRIENDS

AN Association membership *for half price!* True, it is only a half-year membership, but at that it's better than waiting until next year. Two dollars and a half for a Class "C" membership and twelve and a half for a company membership until September 30th, thus covering Convention time. Ask the Secretary to send application blanks to your friends, who have been awaiting this opportunity.

from several angles, and if this hope is fulfilled we will publish them in the June issue of *Western Gas* giving credit where credit belongs—to those who contribute their bit to this worthy cause.

Perhaps there are some members who will join with the Secretary in wondering why there are no questions on Accounting problems. The Secretary put this question to Dave Martin, our efficient Treasurer, who is auditor for a little company in Northern California known as the Pacific Gas and Electric Company. Dave explained it perfectly by saying that auditors and accountants do not ask questions, they answer them.

Some of the Questions to be Asked and Answered During Northern Regional Conference

COMMERCIAL

1. Northwest Gas Sales Council?
Would the organization of a Northwest Gas Sales Council be helpful to the Sales Department of gas companies in the Northwest? What are the advantages and objections to such an association and how could it tie in with the Commercial Section of the P. C. G. A.?
2. Range Campaign?
What success has been met with in the Spring gas range campaigns? Give details of methods used mentioning especially any novel features.
3. Water Heating?
Is the electric water heater a serious competitor even at lower rates? Are users satisfied with them and to what extent do they give satisfactory hot water service?
Does the low-consumption gas water heater meet this competition successfully? Does it give satisfactory service and is it a load builder? Let us have details.
4. Domestic Cooking?
What is happening to the domestic cooking load? Can women be persuaded to do more home cooking? Can husbands be induced to demand cooked food instead of a nosebag of horsefeed?
How are we to stop the inroads of electric cooking? Are the users of electric ranges satisfied? Do they admit that the ranges are slow? Do they admit that the bills are high?
Has any gas company tried the maintenance of a reference library of cook books?
5. Refrigeration?
What has been the experience so far in selling and maintaining gas refrigerators? What about operating costs?
6. Blue Star Home Plan?
Is the Blue Star Home Plan the answer to the gas man's prayer? What is the most effective means of introducing it and at the same time enlist full dealer cooperation?
7. Trade In Allowances?
The necessity of making trade-in allowances on old stoves when new gas ranges are sold, is a heavy burden on dealers and the merchandising departments of gas companies. How can it be controlled without sacrificing sales? Could the used automobile allowance plan be successfully adapted to gas ranges?
8. Rate Structures?
Are existing gas rates based upon present business conditions? If the commercial executive were free to set his own prices as is the sales executive of a manufacturing concern, what would he do and how would he go about it?
9. Compressed Gas?
Can compressed gases such as Rock Gas or Pyrofax be used by gas companies to hold territory for gas which is not yet on the company's main?

TECHNICAL

1. Coal Gas Plant Operation?
In a small coal gas plant with only one holder, there is difficulty in maintaining a sufficiently uniform heating value. The plant is not large enough to warrant the employment of a head gas maker, and the stokers are often too busy to watch the operation closely. Occasionally, therefore, the seal will be lost, the vacuum will become too high or the heats will be affected. Also, during peak hours, the gas appears to go right through the holder without mixing and this tends to aggravate the situation. Is there a practical and inexpensive solution for this condition?
2. Electric Precipitators for Tar?
How successful is the electric precipitator in the de-tarring of gas? Please furnish operating data and details.
3. Water Gas Tar?
What can be said about the de-emulsifying of water gas tar? What is the most successful apparatus? Give details.
4. Dust in Mains and Services?
What practical solution is there for the prevention and removal of dust from mains and services?
5. Gas Plant Smoke?
What experience have members had in regard to complaint of smoke conditions at their plants? Is the use of cyclones or other such apparatus effective in removing cinders and solid matter from the stacks of oil and water gas generators? Supply data.

PUBLIC RELATIONS

1. High Bill Complaints?
What is the best way to handle high bill complaints? What proportion of complaints can really be satisfied by the method you recommend?

Campaigning Appliances *in* Vancouver, B. C.

By F. H. Fullerton

LAUNCHING out in two campaigns with the increasing of gas consumption in Greater Vancouver as their object, the British Columbia Electric Railway Company's gas department has been very active selling gas fires and ranges during the past year. While steady advertising and canvassing work is carried on throughout the year, special drives are made from time to time. During the last gas fire campaign, which lasted for four weeks, the company sold four hundred and thirty-two gas fires, and a gas range campaign is at present being staged with apparently equal successful results.

GAS FIRE CAMPAIGN

The gas fire campaign was staged during the middle of fall, which in Vancouver is an ideal time for such a campaign. Weather conditions vary from days of comparative warmth to days of dull dreary rain and easternly winds.

The logical moment being selected, the company followed up the appeal of the weather by making an attractive easy-payment-term offer to induce the citizens to secure a gas fire for auxiliary heat. Installing a gas fire in the home for $1.00 down, and the balance in 10 equal monthly payments was the plan featured.

With a crew of ten salesmen covering the entire area of Greater Vancouver it was considered that the results in individual districts might be so small as to discourage the men, and it was hence decided to concentrate all the salesmen in one district at a time. In this way the crew members would be working together and could provide impetus to each other's work. The possibility of a saleman's own territory being neglected while he was engaged on this work was eliminated by conducting the concetrated canvass in the mornings, while in the afternoon each salesman worked his own particular territory on routine sales development.

The appeal used in the newspaper and direct mail advertising by the company stressed the cheapness of the offer, the convenience which gas fires offered over the wood or coal fire, and the saving of money and trouble through being able to do without lighting the furnace.

The monthly installments were added to the gas bills of the purchasers at the end of each month.

RANGE CAMPAIGN

At present the British Columbia Electric gas department is staging a gas range campaign, somewhat similar methods to those used in the gas fire drive being utilized with excellent results.

The company is offering the ranges on terms of $1.00 down, and the balance spread over 10 months. A broadside which was distributed by direct mail opened the campaign. This broadside was set up in type by the printers and sent to the engravers before running. An electrotype was then made from the type forms, and a saving in the advertising layout cost for newspaper space was effected. The broadside copy was thus a reproduction of the newspaper advertisements which opened the campaign. These advertisements were followed by other advertisements which were three columns wide by 10 inches deep, the opening newspaper advertisement of the series being four columns wide. The series of advertisements were run in the four local daily papers during the four-week effort.

Even when no special campaigns are under way the gas departments of the B. C. Electric is active in the merchandising of gas appliances. January is generally acknowledged as being a slow month for selling large appliances—yet during January of this year the company sold 57 gas ranges, and 82 gas fires in its three gas appliance stores. Among other appliances sold were eight automatic water heaters, 16 tank heaters, 22 hot plates, one gas furnace, five radiators, one hot-water boiler, 15 industrial burners, six kitchen heaters, and one thermostat. It is estimated that the annual revenue secured for the company in gas con-

(Continued on Page 83)

EDITORIAL

The New Southwest

WHILE to some degree the Southwest has always had its manufactures, its industrial status in the very close past altogether dwindles in comparison to the amazing development of today. Natural gas men who come to Dallas will breath inspiration from the hearty optimism which accompanies the outreach of the natural gas industry in this section, based upon bountiful gas resources and a limitless fund of courage and initiative on the part of the industry's leaders in the Southwest.

When fifty millons of dollars or more are poured into gas transmission undertakings in the short span of two or three years, it almost takes the breath—until one gets behind the scenes and sees the firm industrial growth that runs mile for mile with the new gas mains. Cotton may be king in the Southwest, but manufacturing enterprise is setting up a fief that will soon give the sovereign some concern. Natural gas is in large part accountable for this desirable state of affairs. Sugar mills, paper mills, cotton gins, sulphur mines, brick, tile and other ceramic plants, oil refineries, ice plants, meat packing plants, and a host of other major and minor industries already bespeak the aid of the gas operator. With its mineral wealth and agriculture as a background the Southwest should take a leading place in the nation's industrial life, and in making an ideal fuel available to industry the natural gas man is ushering in this new day.

A Lesson from New England

ON April 3 there appeared in 90 New England newspapers the first of a series of advertising messages, aimed at the domestic user or prospective user of gas. That the campaign shows a general excellence is not to be wondered at, for its preparation has followed well conceived lines which other sections of the country might well imitate. A publicity conference committee functioning under the New England Gas Association and representing in its membership association directors, and gas companies and appliance manufacturing companies contributing to the advertising fund, is in general charge. *Western Gas* will later present the substance of this campaign in some detail, for it appears that New England is leading in a field long contemplated by the gas industry—that of cooperative advertising.

Los Angeles in 1929!

MAY 7-10, convention dates for the Natural Gas Department, American Gas Association annual convention, will find a goodly number of West Coast gas men on hand in Dallas, Texas, the scene of this year's conference. They are coming to see re-enacted a story that in some of its phases has already transpired in California. We have reference to the industrial awakening that follows the general availability of natural gas fuel for industrial uses. Industry in the great Southwest is now beginning to feel in full measure the force of this industrial asset; California manufacturers have been in a favored position with respect to availability of natural gas for years past.

This natural gas activity in California heads up in the Los Angeles metropolitan area. In Los Angeles, natural gas operators, natural gasoline companies, and petroleum companies (which provide the bulk of the state's natural gas production, from oil leases) have their headquarters. In Los Angeles and vicinity are located sizeable industrial plants of a wide manufacturing range, and including many branch factories of internationally established lines such as automotive and tire manufacturing concerns.

Western Gas holds no particular brief for Los Angeles, but as the center of the far-western natural gas picture that city commands attention from natural gas men. Natural gas practice is advanced in many phases in this section. High pressure transmission and distribution, high pressure storage—and "high pressure" industrial utilization and sales—are here to be observed.

All of which leads up to the statement that Los Angeles is the logical site for the 1929 convention of the Natural Gas Department. Natural gas men of the nation can benefit from a convention period in southern California. California stands as the second state in point of natural gas production. Her production problems, and her utilization practices, are somewhat different than those of the Southwest.

Particularly, after the 1928 convention has enabled natural gas men to see the tremendous new industry of the developing Southwest, a convention at Los Angeles would round out the complete natural gas panorama.

Los Angeles in 1929!

Natural Gasoline Ass'n Plans May Convention

By A. V. BOURQUE
Secretary-Treasurer, Natural Gasoline Association of America

A. V. Bourque

THE seventh annual convention of the Natural Gasoline Association of America, to be held May 22, 23 and 24 at Tulsa, Okla., bids fair to be one of the most important meetings ever held by that organization. Not only is a large attendance expected, but the timeliness of the papers to be presented, together with the prominence of their authors, lends especial interest to this year's meeting.

In past years the convention programs of the Association have been largely composed of papers devoted to plant operation. Manufacturing methods now in vogue have become standard and, while the Association does not feel that the ultimate has been reached in plant practice, new problems have arisen during the past year which are demanding serious attention from everyone engaged in the natural gasoline industry, and subjects such as: volatility of natural gasoline; gas lift; gas and gasoline analysis; methods in marketing; and by-products of natural gasoline, are of paramount importance. It is for this reason, therefore, that this year's program will carry many subjects not heretofore discussed on the floor of the conventions.

REPORT ON RESEARCH PROJECTS

One of the high-lights of the meeting will be the second progress report of the Research Department of the Natural Gasoline Association of America. Two years ago, the Association determined on a research program devoted to developing greater utilization of natural gasoline. The Association was fortunate in securing the services of Dr. George Granger Brown, Ph. D., Ch. E., associate professor of chemical engineering, University of Michigan, to direct the research work of the Association. Last year Dr Brown's work was largely given over to determining the value of natural gasoline as a component of good motor fuel, while his work this year has been directed to the investigation of the gas lock in automobile carburetors, why it occurs, where it occurs and how to eliminate same.

Another feature of this year's program will be the gasoline plant inspection trip in the Seminole district which will be under the auspices of the Association.

Program details are given below:

PROGRAM

May 22

MORNING SESSION—8:30 A. M.

F. L. Chase, Lone Star Gas Company, Chairman.

8:30 A. M.—Registration.
9:30 A. M.—Welcoming address—F. L. Chase, Lone Star Gas Company.
President's annual address—H. A. Trower, Phillips Petroleum Company.
Secretary-Treasurer's report—A. V. Bourque.
Paper: Theory and Practice of Automatic Control—T. G. Laney, Fisher Governor Co.
Discussion: Led by W. A. Melton, Shaffer Oil & Refining Co.

AFTERNOON SESSION

E. L. Peck, Empire Gasoline Company, Chairman.

Paper: Theory and Practice of Rectification in Natural Gasoline Plants—L. S. Gregory, Consulting Engineer, Tulsa, Oklahoma.
Discussion: Led by G. G. Oberfell, Phillips Petroleum Company.
Paper: Some Considerations Affecting the Butane Supply—S. C Carney, Roxana Petroleum Corporation.
General discussion from floor.
Paper: Second Progress Report of the Research Department—Dr. George Granger Brown, Department of Chemical Engineering, University of Michigan; Director of Research, Natural Gasoline Association of America.

NIGHT SESSION

Geo. L. Ratcliffe, General Petroleum Corporation—Chairman

Continuation of Dr. Brown's report.
General discussion from floor

May 23

MORNING SESSION—10:00 A. M.

Emby Kaye, Skelly Oil Company—Chairman.
Paper: Volatility of Natural Gasoline—G. C. Oberfell, Phillips Petroleum Company.
Discussion: Led by S. C. Carney.
Paper: The Gas Lift and Repressuring and Their Relation to the Natural Gasoline Industry—H. B. Bernard, Sinclair Oil & Gas Co.
Discussion: Led by G. M. Davidson, Empire Gasoline Company.

AFTERNOON SESSION

Dr. E. R. Lederer, Texas Pacific Coal & Oil Co.—Chairman.

Paper: Methods in Marketing—W. T. Anderson, The Oil & Gas Journal.
Discussion: Led by D. E. Buchanan, Chestnut & Smith Corporation.
Paper: Importance of Gas and Gasoline Analysis to the Natural Gasoline Industry—W. W. Robinson, Jr., California Gasoline Company.
Discussion: Led by Geo. P. Bunn, Phillips Petroleum Company.

NIGHT SESSION

Stag Smoker.

May 24

Plant Inspection Trip to the Seminole District.

OFFICERS OF ASSOCIATION

The Natural Gasoline Association of America is a national organization, having its headquarters at Tulsa, Oklahoma. It was organized in 1921. Its officers and directors are:

President: H. A. Trower, Phillips Petroleum Company, Bartlesville, Oklahoma.

Vice-presidents: S. C. Carney, Roxana Petroleum Corporation, Tulsa, Oklahoma; E. R. Lederer, Texas Pacific Coal & Oil Company, Fort Worth, Texas; Geo. L. Ratcliffe, General Petroleum Corporation, Los Angeles, Calif.

Directors: A. M. Ballard, Sun Oil Company, Tulsa, Oklahoma; H. B. Bernard, Sinclair Oil & Gas Co., Tulsa, Oklahoma; D. E. Buchanan, Chestnut & Smith Corp., Tulsa, Oklahoma; Geo. A. Burrell, Burrell Oil & Gasoline Co., Pittsburgh, Pennsylvania; F. L. Chase, Lone Star Gas Company, Dallas, Texas; W. G. Clute, Prairie Oil & Gas Co., Independence, Kansas; W. M. Corbet, Eagle Pitcher Lead Company, Henryetta, Oklahoma; F. C. Hall, The Henderson Company, Tulsa, Oklahoma; John M. Hall, Oil State Gasoline Company, Tulsa, Oklahoma; J. E. Hare, California Gasoline Company, Los Angeles, Calif.; L. B. Jackson, Oklahoma Gasoline Plants, Inc., Tulsa, Oklahoma; Emby Kaye, Skelly Oil Company, Tulsa, Oklahoma; W. A. Melton, Shaffer Oil & Refining Co., Tulsa, Oklahoma; M. E. Mockley, Amerada Petroleum Corporation, Tulsa, Oklahoma; E. L. Peck, Empire Gasoline Company, Bartlesville, Oklahoma; J. A. Rofferty, Carbide & Carbon Chemicals Corporation, New York, N. Y.; F. E. Rice, Phillips Petroleum Company, Bartlesville, Oklahoma; Charles Roeser, Roeser & Pendleton, Fort Worth, Texas; A. J. Schlosser, Barnsdall Oil Company, Tulsa, Oklahoma; O. H. Schoenwald, L. H. Wentz-Oil Division, Ponca City, Oklahoma; Geo. Shallenberger, Marland Refining Company, Ponca City, Oklahoma.

"BLUE STAR" APARTMENT COURT AT PORTLAND

The Portland Gas & Coke Company is just completing the installation of 16 enamel gas ranges in which are incorporated thermostatic oven controls, 16 refrigerators of the latest type gas-fired, 16 gas tank heaters thermostatically controlled, connected to insulated tanks, and 16 of the ventilated type circulating house heating appliances.

In addition to these gas appliances, there is also a large laundry room where an automatic gas-fired heavy duty domestic water heater system is being installed together with gas-fired clothes dryers, gas-fired washing machines, and gas-fired ironers.

In addition to the above transaction made by our Sales Department, co-operating with Turner-Duncan Company, local building contractors, one other installation equally as large is in the offing, with good prospects for an all-gas installation.

The apartments just described are located at 21st and Kaufman Sts., Vancouver, Wash., which city is supplied by high pressure gas from the Portland plant.

MONTANA GAS SUPPLY

Sunburst Oil & Refining Company has contracted to sell its Kevin-Sunburst gas supply to the Northern Natural Gas Development Company and Montana Cities Gas Company, for consumption in Great Falls.

Hope Engineering & Supply Company expected to complete the Great Falls pipe line by May 1st.

Natural Gas Statistics *for* 1926

Natural gas consumed in the United States, 1925-26

State	Domestic				Industrial							
			Value at points of consumption		Field (drilling, pumping, and operating gasoline recovery plants)		Other industrial, including use in manufacture of carbon black			Total industrial		
	Number of consumers	M cubic feet	Total	Average (cents)	M cubic feet (estimated)	Value at points of consumption (estimated)	M cubic feet	Value at points of consumption		M cubic feet	Value at points of consumption	
								Total	Average (cents)		Total	Average (cents)
1925												
Arkansas	47,360	6,146,000	$ 2,753,000	44.8	36,103,000	$2,159,000	9,294,000	$1,727,000	18.6	45,397,000	$ 3,886,000	8.6
California	561,710	18,684,000	13,572,000	72.6	109,333,000	8,200,000	59,772,000	10,815,000	18.1	169,105,000	19,015,000	11.2
Colorado	9	900	500	55.6	547,000	60,000	26,500	600	2.3	573,500	60,600	10.6
Illinois	11,700	250,000	162,000	64.8	3,915,000	703,000				3,915,000	703,000	18.0
Indiana	16,480	747,000	370,000	49.5	31,000	11,000	1,008,000	482,000	47.8	1,039,000	493,000	47.4
Kansas	[1]140,790	9,647,000	6,301,000	65.3	10,263,000	844,000	28,774,000	4,874,000	16.9	39,037,000	5,718,000	14.6
Kentucky	130,780	11,185,000	4,605,000	41.2	797,000	77,000	6,619,000	1,044,000	15.8	7,416,000	1,121,000	15.1
Louisiana	35,680	5,219,000	1,583,000	30.3	18,085,000	553,000	124,696,000	4,379,000	3.5	142,781,000	4,932,000	3.5
Michigan	5	400	200	50.0								
Missouri	100,120	4,846,000	4,557,700	94.1			526,000	153,000	29.1	526,000	153,000	29.1
Montana	5,705	1,303,000	574,000	44.1	254,000	9,000	1,051,000	27,000	2.6	1,305,000	36,000	2.8
New York	222,750	16,055,000	9,872,000	61.5	254,000	76,000	194,000	103,000	53.1	448,000	179,000	40.0
Ohio	1,094,120	83,722,000	46,848,000	56.0	4,148,000	744,000	24,099,000	11,043,000	45.8	28,247,000	11,787,000	41.7
Oklahoma	155,780	16,592,000	8,814,000	53.1	137,444,000	10,171,000	55,422,000	8,479,000	15.3	192,866,000	18,650,000	9.7
Pennsylvania	582,520	55,797,000	33,500,000	60.0	7,845,000	1,883,000	55,833,000	18,563,000	33.2	63,678,000	20,446,000	32.1
South Dakota	53	4,200	2,300	54.8								
Tennessee	48	8,500	2,000	23.5								
Texas	212,240	15,179,000	9,888,000	65.1	61,819,000	3,227,000	65,487,000	8,867,000	13.5	127,306,000	12,094,000	9.5
West Virginia	167,070	23,984,000	7,739,000	32.3	12,404,000	1,709,000	37,862,000	8,674,000	22.9	50,266,000	10,383,000	20.7
Wyoming	10,710	2,169,000	927,000	42.7	20,261,000	845,000	21,997,000	2,117,000	9.6	42,258,000	2,962,000	7.0
Other[2]	12,370	607,000	423,300	69.7	21,000	2,000	108,500	69,400	64.0	129,500	71,400	55.1
	[1]3,508,000	272,146,000	152,494,000	56.0	423,524,000	31,273,000	492,769,000	81,417,000	16.5	916,293,000	112,690,000	12.3
1926												
Arkansas	52,210	7,824,000	3,532,000	45.1	35,195,000	1,615,000	9,611,000	1,880,000	19.6	44,806,000	3,495,000	7.8
California	632,600	20,960,000	14,801,000	70.6	123,953,000	10,177,000	60,002,000	10,517,000	17.5	183,955,000	20,694,000	11.2
Colorado	1,974	78,800	68,000	86.3	378,000	34,000	47,000	23,000	48.9	425,000	57,000	13.4
Illinois	11,910	203,000	142,000	70.0	3,605,000	721,000				3,605,000	721,000	20.0
Indiana	13,860	722,000	386,000	53.5	72,000	30,000	1,060,000	490,000	46.2	1,132,000	520,000	45.9
Kansas	142,730	10,133,000	6,905,000	68.1	11,536,000	873,000	39,473,000	6,603,000	16.7	51,009,000	7,476,000	14.7
Kentucky	137,500	12,404,000	5,258,000	42.4	874,000	81,000	4,848,000	780,000	16.1	5,722,000	861,000	15.0
Louisiana	35,710	4,413,000	1,669,000	37.8	25,763,000	796,000	118,710,000	4,447,000	3.7	144,473,000	5,243,000	3.6
Michigan	6	400	200	50.0								
Missouri	100,300	5,288,000	4,843,400	91.6			531,000	154,000	29.0	531,000	154,000	29.0
Montana	6,345	1,383,000	589,000	42.6	290,000	11,000	1,622,000	50,000	3.1	1,912,000	61,000	3.2
New Mexico	140	28,000	5,000	17.9	893,000	70,000				893,000	70,000	7.8
New York	235,290	16,909,000	11,004,000	65.1	491,000	157,000	464,000	282,000	60.8	955,000	439,000	46.0
Ohio	1,124,080	87,672,000	53,970,000	61.6	3,130,000	580,000	24,917,000	11,432,000	45.9	28,047,000	12,012,000	42.8
Oklahoma	166,660	17,617,000	8,840,000	50.2	159,269,000	12,694,000	68,107,000	11,717,000	17.2	227,376,000	24,411,000	10.7
Pennsylvania	599,900	56,148,000	33,912,000	60.4	7,988,000	1,873,000	61,700,000	20,939,000	33.9	69,688,000	22,812,000	32.7
South Dakota	375	10,100	14,000	138.6								
Tennessee	80	5,500	1,300	23.6	6,000	600				6,000	600	10.0
Texas	279,380	18,045,000	11,986,000	66.4	69,369,000	3,996,000	99,927,000	14,825,000	14.8	169,296,000	18,821,000	11.1
West Virginia	165,800	25,700,000	8,166,000	31.8	14,225,000	1,940,000	32,859,000	8,231,000	25.0	47,084,000	10,171,000	21.6
Wyoming	11,280	2,880,000	1,314,000	45.6	21,136,000	1,000,000	21,598,000	2,160,000	10.0	42,725,000	3,160,000	7.4
Other[2]	12,670	751,200	534,100	71.1	15,000	1,400	23,000	5,000	21.7	38,000	6,400	16.8
	3,730,800	289,175,000	167,940,000	58.1	478,188,000	36,650,000	545,490,000	94,535,000	17.3	1,023,678,000	131,185,000	12.8

[1] Revised figures.
[2] 1925: Alaska, Iowa, Maryland, New Mexico, and North Dakota; 1926: Alaska, Maryland, and North Dakota.

Statistics of natural gas in the United States, 1917-1926

Year	Produced and delivered to consumers (billions of cubic feet)	Treated for recovery of natural-gas gasolins		Domestic Consumption				Industrial Consumption					
		Billions of cubic feet	Per cent of total consumption	Number of consumers (thousands)	Billions of cubic feet	Per cent of total consumption	Average value at points of consumption per M cubic feet (cents)	Field (billions of cubic feet)	Carbon black (billions feet)	Other industrial (billions of cubic feet)	Total industrial (billions of cubic feet)	Per cent of total consumption	Average value at points of consumption per M cubic feet (cents)
1917	795	429	54	2,431	258	32	30.8	(1)	(1)	(1)	537	68	11.7
1918	721	449	62	2,509	271	38	31.4	(1)	(1)	(1)	450	62	15.2
1919	746	480	64	2,501	256	34	34.6	170	50	270	490	66	14.8
1920	798	496	62	2,615	286	36	38.2	202	41	269	512	64	17.0
1921	662	465	70	2,631	248	38	44.4	182	51	181	414	62	15.5
1922	763	545	71	3,015	255	33	49.9	198	54	256	508	67	18.6
1923	1,007	876	87	3,234	277	28	51.4	343	109	278	730	72	13.4
1924	[2]1,142	1,016	89	3,443	285	25	54.0	393	157	306	856	75	11.6
1925	[2]1,189	1,040	88	[3]3,508	272	23	56.0	424	140	352	916	77	12.3
1926	[2]1,313	1,206	92	3,731	289	22	58.1	478	131	415	1,024	78	12.8

[1] Figures not available.
[2] Includes gas piped to Canada and Mexico; see p. 177.
[3] Revised figures.

By G. R. HOPKINS[1]

*Supervising Engineer, Petroleum and Natural Gas Statistics, United States Department of Commerce, Bureau of Mines**

THE natural-gas industry in the United States continued to grow slowly but steadily in 1926 when 1,313,019,000,000 cubic feet of gas was produced and delivered to consumers, an increase of 10 per cent over 1925. Of this amount 166,000,000 cubic feet was piped to Mexico and Canada, and 1,312,853,000,000 cubic feet was consumed in the United States in 1926. The value of the gas per thousand cubic feet at the wells increased from 9.4 cents in 1925 to 9.5 cents in 1926, and at points of consumption from 22.3 cents in 1925 to 22.8 cents in 1926. Neither of these figures, however, equaled those of 1923 or of some previous years.

Domestic (household) consumers used 22 per cent of the total consumption of natural gas in 1926, and industrial concerns 78 per cent. This indicates a slight growth in amount consumed by the latter in 1926. The total value of domestic consumption, however, was greater, as domestic users paid an avreage of 58.1 cents per thousand cubic feet, as compared with 12.8 cents by industrial concerns. In 1926 there were 3,731,000 domestic consumers of natural gas, as compared with 3,508,000 in 1925. This represents a gain of 223,000, which is, with the exception of 1913 and 1922, the largset yearly increase ever recorded. California and Txeas each recorded an increase of about 70,000 in number of domestic consumers and far surpassed the other States in this respect.

The relative rank of the three chief gas-producing States was unchanged in 1926. Oklahoma, which ranks first, recorded a 15 per cent gain in output; California, which ranks second, a 9 per cent gain; but production in West Virginia, the next ranking State, showed a slight decrease. Texas registered a material gain in output and not only took fourth place from Louisiana but threatens to displace West Virginia in the near future.

The tendency to extract the greatest possible amount of natural-gas gasoline from natural gas before consumption of the gas was very marked in 1926. A total of 1,206,300,000 cubic feet of natural gas was treated for the recovery of natural-gas gasoline in 1926, which is equivalent to 92 per cent of the total production. In 1925 the proportion treated was 88 per cent.

The total consumption of natural gas (including residue gas from natural-gas gaso-

Natural gas produced and consumed in the United States, 1925-26

State	Produced and delivered to consumers, including deliveries in other States						Consumed, including receipts from other States			
	Quantity		Estimated value at the wells		Value at points of consumption		Quantity		Value at points of consumption	
	M cubic feet	Per cent of total	Total	Average per M cubic feet (cents)	Tota	Average per M cubic feet (cents)	M cubic feet	Per cent of total	Total	Average per M cubic feet (cents)
1925										
Ark.	41,878,000	3.5	$ 2,504,000	6.0	$ 5,394,000	12.9	51,543,000	4.3	$ 6,639,000	12.9
Calif.	187,789,000	15.8	14,084,000	7.5	32,587,000	17.4	187,789,000	15.8	32,587,000	17.4
Colo.	574,400	.1	61,000	10.6	61,100	10.6	574,400	.1	61,100	10.6
Ill.	4,165,000	.4	748,000	18.0	865,000	20.8	4,165,000	.4	865,000	20.8
Ind.	1,168,000	.1	424,000	36.3	504,000	43.2	1,786,000	.2	863,000	48.3
Kans.	26,917,000	2.3	2,213,000	8.2	9,991,000	37.1	48,684,000	4.1	12,019,000	24.7
Ky.	10,770,000	.9	1,037,000	9.6	3,213,000	29.8	18,601,000	1.6	5,726,000	30.8
La.	152,620,000	12.8	4,670,000	3.1	8,125,000	5.3	148,000,000	12.4	6,515,000	4.4
Mich.	400	(1)	40	10.0	200	50.0	400	(1)	200	50.0
Mo.	34,000	(1)	3,100	9.1	29,700	87.4	5,372,000	.5	4,710,700	87.7
Mont.	1,496,000	.1	55,000	3.7	350,000	23.4	2,608,000	.2	610,000	23.4
N. Y.	[2]6,210,000	.5	1,863,000	30.0	3,778,000	60.8	16,503,000	1.4	10,051,000	60.9
Ohio.	43,235,000	3.6	7,752,000	17.9	22,377,000	51.8	111,969,000	9.4	58,635,000	52.4
Okla.	249,285,000	21.0	18,447,000	7.4	36,121,000	14.5	209,458,000	17.6	27,464,000	13.1
Pa.	101,632,000	8.6	24,392,000	24.0	47,098,000	46.3	119,475,000	10.0	53,946,000	45.2
S. Dak.	4,200	(1)	400	9.5	2,300	54.8	4,200	(1)	2,300	54.8
Tenn.	8,500	(1)	800	9.4	2,000	23.5	8,500	(1)	2,000	23.5
Tex.	[3]134,872,000	11.3	7,040,000	5.2	19,715,000	14.6	142,485,000	12.0	21,982,000	15.4
W. Va.	180,345,000	15.2	24,851,000	13.8	70,903,000	39.3	74,250,000	6.2	18,122,000	24.4
Wyo.	45,539,000	3.8	1,899,000	4.2	4,149,000	9.1	44,427,000	3.7	3,889,000	8.8
Other [4]	28,500	(1)	2,660	9.3	5,700	20.0	736,500	.1	494,700	67.2
	1,188,571,900	100.0	112,047,000	9.4	265,271,000	22.3	1,188,439,000	100.0	265,184,000	22.3
1926										
Ark.	43,566,000	3.3	2,000,000	4.6	5,817,000	13.4	52,630,000	4.0	7,027,000	13.4
Calif.	204,915,000	15.6	16,803,000	8.2	35,495,000	17.3	204,915,000	15.6	35,495,000	17.3
Colo.	553,800	(1)	50,000	9.0	130,000	23.5	503,800	(1)	125,000	24.8
Ill.	3,808,000	.3	762,000	20.0	863,000	22.7	3,808,000	.3	863,000	22.7
Ind.	901,000	.1	377,000	41.8	379,000	42.1	1,854,000	.1	906,000	48.9
Kans.	38,095,000	2.9	2,884,000	7.6	12,547,700	32.9	61,142,000	4.7	14,381,000	23.5
Ky.	10,410,000	.8	961,000	9.2	3,378,000	32.4	18,126,000	1.4	6,119,000	33.8
La.	157,423,000	12.0	4,864,000	3.1	8,768,000	5.6	148,886,000	11.3	6,912,000	4.6
Mich.	400	(1)	40	10.0	200	50.0	400	(1)	200	50.0
Mo.	1,000	(1)	100	10.0	700	70.0	5,819,000	.4	4,997,400	85.9
Mont.	2,283,000	.2	86,000	3.8	450,000	19.7	3,295,000	.2	650,000	19.7
N. Mex.	921,000	.1	72,000	7.8	75,000	8.1	921,000	.1	75,000	8.1
N. Y.	[5]7,027,000	.5	2,237,000	31.8	4,499,000	64.0	17,864,000	1.4	11,443,000	64.1
Ohio.	47,363,000	3.6	8,781,000	18.5	25,403,000	53.6	115,719,000	8.8	65,982,000	57.0
Okla.	286,421,000	21.8	22,828,000	8.0	42,140,000	14.7	244,993,000	18.7	33,251,000	13.6
Pa.	107,089,000	8.2	25,112,000	23.4	50,040,000	46.7	125,836,000	9.6	56,724,000	45.1
S. Dak.	10,100	(1)	1,010	10.0	14,000	138.6	10,100	(1)	14,000	138.6
Tenn.	11,500	(1)	1,150	10.0	1,900	16.5	11,500	(1)	1,900	16.5
Tex.	[6]175,392,000	13.4	10,085,000	5.7	28,165,000	16.1	187,341,000	14.3	30,807,000	16.4
W. Va.	180,223,000	13.7	24,582,000	13.6	76,396,000	42.4	72,784,000	5.5	18,337,000	25.2
Wyo.	46,567,000	3.5	2,203,000	4.7	4,669,000	10.0	45,605,000	3.5	4,474,000	9.8
Other [4]	38,200	(1)	3,700	9.7	6,500	17.0	789,200	.1	540,500	68.5
	1,313,019,000	100.0	124,693,000	9.5	299,238,000	22.8	1,312,853,000	100.0	299,125,000	22.8

[1] Less than 0.1 per cent.
[2] Includes 68,000 M cubic feet consumed in Canada.
[3] Includes 64,000 M cubic feet consumed in Mexico.
[4] 1925: Alaska, Iowa, Maryland (consumption only), New Mexico, and North Dakota; 1926: Alaska, Maryland (consumption only), and North Dakota.
[5] Includes 79,000 M cubic feet consumed in Canada.
[6] Includes 87,000 M cubic feet consumed in Mexico.

[1] Figures compiled by H. Backus, of the Bureau of Mines.

*This statistical summary represents the latest annual chapter on natural gas and natural-gas gasoline, published by the United States Bureau of Mines.

Natural gas produced in the United States and delivered to consumers, 1917-1926, by States, in millions of cubic feet

Year	Arkansas	California	Illinois	Indiana	Kansas	Kentucky	Louisiana	Montana	New York	Ohio	Oklahoma	Pennsylvania	Texas	West Virginia	Wyoming	Others	Total	Value at points of consumption	
																		Total (thousands of dollars)	Average per M cubic feet (cents)
1917.	5,610	49,427	4,439	1,712	24,439	2,802	31,287	334	8,372	68,917	137,384	133,397	17,047	308,617	[1] 1,223	103	795,110	142,089	17.9
1918.	5,295	39,719	4,473	1,667	27,825	3,022	36,094	177	8,461	61,261	124,317	123,813	13,440	265,161	4,339	1,937	721,001	153,554	21.3
1919.	5,587	55,607	3,825	1,407	16,150	2,057	47,062	858	8,124	63,153	163,649	113,489	24,710	234,095	6,014	129	745,916	160,888	21.6
1920.	9,027	66,041	3,013	1,779	21,158	3,345	58,274	818	8,419	58,938	154,467	125,787	37,063	239,719	10,312	50	798,210	196,194	24.6
1921.	4,260	75,942	2,646	1,066	15,717	4,820	58,004	336	6,583	47,412	124,058	86,144	44,504	174,921	15,608	31	662,052	174,617	26.4
1922.	9,700	84,580	3,383	947	20,289	5,872	70,267	486	6,947	51,481	140,631	101,276	47,945	195,288	23,427	27	762,546	221,535	29.1
1923.	24,215	131,434	4,049	880	30,913	11,953	112,031	1,470	6,497	53,812	203,082	112,562	74,535	203,867	35,523	153	1,006,976	240,001	23.8
1924.	36,616	189,692	4,072	998	25,580	12,875	160,945	1,071	6,196	47,396	214,452	105,863	107,247	182,285	46,036	197	1,141,521	253,856	22.2
1925.	41,878	187,789	4,165	1,168	26,917	10,770	152,620	1,496	6,210	43,235	249,285	101,632	134,872	180,345	45,539	650	1,188,571	265,271	22.3
1926.	43,566	204,915	3,808	901	38,095	10,410	157,423	2,283	7,027	47,363	286,421	107,089	175,392	180,223	46,567	1,536	1,313,019	299,238	22.8

[1] Includes Colorado

line plants) by industrial users in 1926 amounted to 1,023,678,000,000 cubic feet, an increase over 1925 of 12 per cent. The consumption of natural gas for field and industrial uses, exclusive of carbon black, again showed an increase.

Though carbon black output showed an increase in 1926 over 1925, the amount of natural gas consumed in its manufacture decreased. The increased output was due to an increase in percentage of recovery.

Oklahoma, because of its importance as a producer of petroleum and natural-gas gasoline, ranked first among the States in the use of natural gas for field purposes; that is, for drilling, pumping, and operating natural-gas gasoline recovery plants. Louisiana, by reason of being the chief carbon black producer, led in the consumption of natural gas for "other industrial" purposes.

The interstate movement of natural gas in 1926 amounted to 209,527,000,000 cubic feet, a slight increase over 1925. The movement from West Virginia to Ohio and Pennsylvania continued to be of first importance. Of more than passing interest was the increase in the counter movement of gas from Ohio to West Virginia.

Interstate transportation of natural gas, in thousands of cubic feet, 1925-26

State in which gas was produced	State to which gas was transported	1925	1926
Colorado	Wyoming	.....	50,000
Indiana	Kentucky	346,000	408,000
Kansas	Missouri	5,338,000	5,818,000
	Oklahoma	167,000	414,000
		5,505,000	6,232,000
Kentucky	West Virginia	1,603,000	1,595,000
Louisiana	Arkansas	8,370,000	8,063,000
	Texas	6,321,000	6,419,000
		14,691,000	14,482,000
New York	Canada	68,000	79,000
	Pennsylvania	28,000	17,000
		96,000	96,000
Ohio	Indiana	964,000	1,361,000
	West Virginia	824,000	4,709,000
		1,788,000	6,070,000
Oklahoma	Arkansas	549,000	236,000
	Kansas	27,272,000	29,279,000
	Texas	12,173,000	12,327,000
		39,994,000	41,842,000
Pennsylvania	New York	10,389,000	10,933,000
	Ohio	166,000	1,429,000
	West Virginia	2,122,000	2,419,000
		12,677,000	14,781,000
Texas	Arkansas	746,000	765,000
	Louisiana	10,071,000	5,945,000
	Mexico	64,000	87,000
		10,881,000	6,797,000
West Virginia	Kentucky	9,088,000	8,903,000
	Maryland	708,000	751,000
	Ohio	70,356,000	72,997,000
	Pennsylvania	30,492,000	33,511,000
		110,644,000	116,162,000
Wyoming	Montana	1,112,000	1,012,000
		199,337,000	209,527,000

Summary of statistics for natural gas in the United States, 1922-1926

	1922	1923	1924	1925	1926
Natural gas consumed:					
Domestic, millions of cubic feet	254,413	277,050	285,152	272,146	289,175
Industrial—					
Carbon black, do.	53,629	109,096	156,514	140,366	130,321
Field, do.	197,850	343,076	393,437	423,524	478,188
Other industrial, do.	256,654	277,745	306,379	352,403	415,169
	762,546	1,006,967	1,141,482	1,188,439	1,312,853
Domestic, per cent	33.4	27.5	25	23	22
Industrial, do.	66.6	72.5	75	75	78
Treated for natural-gas gasoline:					
Millions of cubic feet	545,139	875,711	1,016,276	1,040,390	1,206,300
Per cent of total consumption	71.5	87.0	89	88	92
Domestic consumers, thousands	3,015	3,234	3,443	[1]3,508	3,731
Value of natural gas at wells:					
Total, thousands of dollars	84,873	100,849	105,779	112,047	124,693
Average per M cubic feet, cents	11.1	10.0	9.3	9.4	9.5
Value of natural gas at points of consumption:					
Total, thousands of dollars	221,535	239,995	253,830	265,184	299,125
Domestic, do.	126,902	142,317	154,075	152,494	167,940
Industrial, do.	94,633	97,678	99,755	112,690	131,185
Average per M cubic feet—					
Domestic, cents	49.9	51.4	54.0	56.0	58.1
Industrial, do.	18.6	13.4	11.6	12.3	12.8
Domestic and industrial, do.	29.1	23.8	22.2	22.3	22.8
Natural-gas gasoline (raw):					
Quantity, thousands of gallons	505,832	816,226	933,861	1,127,470	1,363,090
Value at plants—					
Total, thousands of dollars	72,711	77,268	82,233	120,383	136,412
Average per gallon, cents	14.4	9.5	8.8	10.7	10.0
Carbon black:					
Quantity, thousands of pounds	67,795	138,263	186,872	177,417	180,576
Value at plants—					
Total, thousands of dollars	5,820	11,692	11,565	9,640	9,939
Average per pound, cents	8.6	8.5	6.2	5.4	5.5

[1]Revised figures.

Bringing Dust Problems Under Control

(Continued from Page 43)

cipally for the reason that as soon as dust troubles cease the tendency is (because of operating expense) to stop injecting oil for the time being; the result is that the distributing system gets pretty thoroughly dried out and dust is free to move in great quantities before it makes its appearance known. This is due to the fact that there is a definite relationship between the force of gravity holding the dust still and the velocity of the gas causing it to travel. To illustrate: Let it be supposed that on a system dust troubles appeared in the winter. Oil injection was immediately commenced, and later, during the summer when the dust complaints reached the minimum, oil injection was stopped. A period of quietude would exist until the following winter when cold days brought heavy loads with consequently high velocities in the pipes. On some day when the velocity reached a critical point the dust would fly into suspension, and dust complaints would be had all over the system simultaneously. Consequently, if oiling is started it should be kept up indefinitely; and because of the operating costs involved it appears to the writer that the installation of dust traps offers the better expedient. With the record of dust recovered the calls for cleaning can be regulated. On peak days, when conditions are exceptionally severe and large quantities of dust are being collected, as shown by the photograph, a call can be made every day if necessray, whereas in the summer time possibly a call is necessary but once a week.

SOUTHERN CALIF. FURNACES TO CLEVELAND FOR TEST

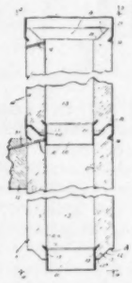
The several members of the Gas Furnace Association of Southern California, having secured approval of the American Gas Association Laboratory upon one model each of their respective furnaces, are submitting their additional lines for Laboratory test by the 14th of May. Brandon Finney, representing the Association, is in Cleveland to be at hand during the testing work. Some 20 more models are being included for test by the seven members of the Association. Mr. Finney left for Cleveland soon after April 1st. While there he attended the convention on April 23, 24, 25 of the National Warm Air Heating & Ventilating Association, held at the Stevens Hotel, Chicago.

P. G. AND E. TO CONNECT FIVE MORE COMMUNITIES

Niles, Decoto, Centerville, Alvarado and Newark, California, will have gas as a result of the Pacific Gas and Electric Company project to extend 20 miles of high pressure transmission main, to cost $113,000. Gas for this territory will be manufactured in Oakland, and a holder of 200,000 cu. ft. capacity will be erected for reserve supply south of Hayward. Distribution mains will cost $55,000 for the extension.

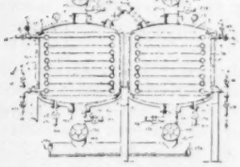
THIS MONTH'S PATENTS PERTAINING TO THE INDUSTRY

1,659,669. JOINT CONSTRUCTION FOR PIPES OR THE LIKE. LINCOLN B. SHERWOOD, Long Beach, Calif. Filed Nov. 12, 1924. Serial No. 749,438. 1 Claim. (Cl. 72—53.)



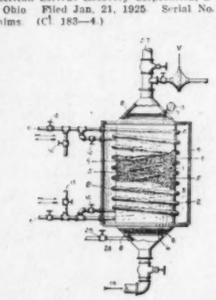
A joint construction for sections of monolithic pipe including, a sheet metal flange having a part embedded in the end portion of one section and a part projecting from the end of that section to hold the adjacent end of the next section, said adjacent section having a nail hole formed through its wall at a point to be covered by the flange when the sections are together.

661,140. PROCESS FOR TREATING GASES. OSCAR L. BARNEBEY, Columbus, Ohio, assignor to American Solvent Recovery Corporation, a Corporation of Ohio. Filed Jan. 21, 1925. Serial No. 3,878. 12 Claims. (Cl. 183—4.)



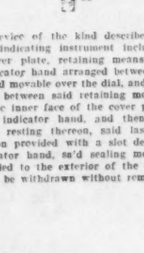
1. In a process of separating gases, passing a gaseous mixture into activated carbon and removing the adsorbable portion from said gaseous mixture by the activated carbon while allowing the unadsorbable portion to pass, expelling the adsorbed portion from the activated carbon by means of indirect heat applied to the interior of the body of activated carbon carrying the adsorbed gaseous material, cooling and collecting the gaseous matter thus expelled.

1,661,104. APPARATUS FOR TREATING GASES. OSCAR L. BARNEBEY, Columbus, Ohio, assignor to American Solvent Recovery Corporation, a Corporation of Ohio. Filed Jan. 21, 1925. Serial No. 3,880. 16 Claims. (Cl. 183—4.)



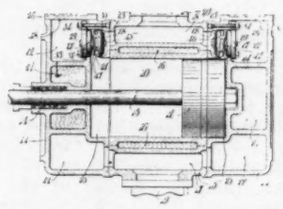
1. In an apparatus for treating gases, a tower containing activated carbon and having an inlet for conducting gaseous material to the carbon for treatment thereby and an outlet for withdrawing gaseous material issuing from the carbon and a conduit in close proximity to the carbon and having separate connections to heating and cooling supplies.

1,630,070. PROTECTIVE DEVICE FOR GAUGES. WILLIAM K. SIMPSON, Waterbury, Conn., assignor to Hoffman Specialty Company, Waterbury, Conn., a Corporation of Illinois. Filed Mar. 17, 1925. Serial No. 16,207. 11 Claims. (Cl. 116—129.)



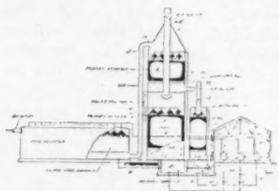
10. In a device of the kind described and in combination, an indicating instrument including a casing, a dial, a cover plate, retaining means for the cover plate, an indicator hand arranged between the dial and cover plate and movable over the dial, and a sealing member extending between said retaining means and casing and within the inner face of the cover plate to a point adjacent the indicator hand, and thence extended to the dial and resting thereon, said last-mentioned extending portion provided with a slot detachably receiving the indicator hand, said sealing member having a portion extended to the exterior of the casing, whereby the same may be withdrawn without removing the cover plate.

1,659,814. VALVE. FRANK A. HALLECK, Chicago, Ill., assignor to Sullivan Machinery Company, a Corporation of Massachusetts. Filed June 28, 1921. Serial No. 481,143. 29 Claims. (Cl. 230—201.)



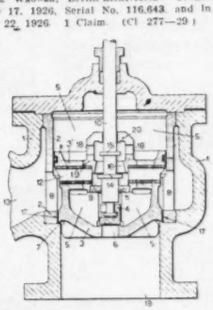
1. In a compressor, the combination with a cylinder, of a combined inlet and discharge valve structure attachable to and detachable from said cylinder as a unit and including means for maintaining the parts thereof relatively immovable when detached from the cylinder but permitting relative separable adjustment thereof and maintaining the same in fixed adjusted position.

1,660,741. GAS-PURIFICATION PROCESS AND APPARATUS. EUGENE H. BIRD, Pittsburgh, Pa., assignor to The Koppers Company, Pittsburgh, Pa., a Corporation of Pennsylvania. Filed Nov. 24, 1922. Serial No. 603,062. 22 Claims. (Cl. 23—3.)



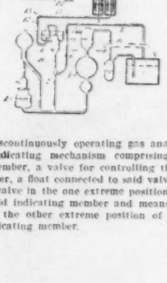
3. The process of purifying gases which consists in passing the gas into contact with a relatively large volume of alkaline liquid absorbent agent to absorb the bulk of the hydrogen sulphide impurities from the gas, then passing the thus purified gas into contact with a relatively smaller volume of alkaline liquid absorbent agent distributed over a relatively large area to absorb the residue of hydrogen sulphide from the gas, substantially as specified.

1,659,846. VALVE COMPRISING AN EQUALIZING CHAMBER, A MAIN AND AN AUXILIARY VALVE. FRITZ WAGNER, Berlin-Lichterfelde, Germany. Filed June 17, 1926. Serial No. 116,643, and in Germany May 22, 1926. 1 Claim. (Cl. 277—29.)



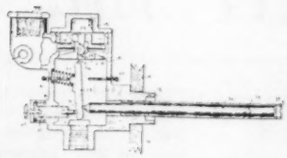
A valve comprising a casing, means for supplying fluid under pressure to said casing, an equalizing chamber, a main valve and an auxiliary valve in said casing, means for operating said auxiliary valve, a dog and a throttling device both operatively connected with said means, and a check on said main valve adapted to cooperate with said dog the distance between said dog and said check not exceeding the relative displacement of said throttling device and said main valve which is required for the maximum throttling action on the connection between said fluid supplying means and said equalizing chamber.

1,661,049. GAS-ANALYSIS RECORDER. OLOF ROHDE, Stockholm, Sweden, assignor to Svenska Aktiebolaget Mono, Stockholm, Sweden, a Corporation. Filed Nov. 29, 1922, Serial No. 604,036, and in Sweden Dec. 6, 1921. Renewed Jan. 14, 1928. 9 Claims. (Cl. 23—256.)



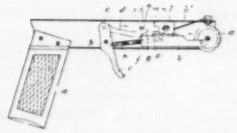
1. In a discontinuously operating gas analyzing apparatus, an indicating mechanism comprising a movable indicating member, a valve for controlling the movement of said member, a float connected to said valve, means for opening the valve in the one extreme position of the float to release said indicating member and means for closing the valve in the other extreme position of the float to lock said indicating member.

1,660,776. THERMOSTATIC CONTROL DEVICE FOR WATER HEATERS. JOHN G. WRAGG, New London, Conn. Filed Nov. 8, 1926. Serial No. 146,996. 4 Claims. (Cl. 236—48.)



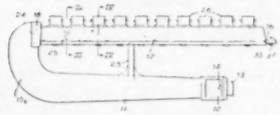
1. A thermostatic gas control device for water heaters and the like, comprising in combination the following elements; a suitable supporting frame or casing, a gas-control valve; a heat expansible member adapted to be placed in proximity to the water to be heated, a swinging lever adapted to be swung by the expansion of said heat expansible member, a second swinging lever one end of which is adjacent said gas valve and the other end of which is in substantial proximity to the outer end of said first named lever, said second-named lever being adapted when in one position to close said valve and when in another position to open same and a thrust snap-spring located between the proximate ends of said swinging levers and having its ends operatively connected to the same respectively and being adapted, when said first named swinging lever is swung, to swing said second named swinging lever and to hold the same either in the position whereby said gas valve is opened or in the position whereby said gas valve is closed but to prevent said second swinging lever from remaining in an intermediate position.

1,660,277. GAS-IGNITING DEVICE. KARL SCHERER, Erlangen, near Nuremberg, Germany, assignor to Max E. Bernhardt, New York, N. Y. Filed Feb. 10, 1927, Serial No. 167,329, and in Germany Feb. 1, 1926. 1 Claim. (Cl. 67—6.1.)



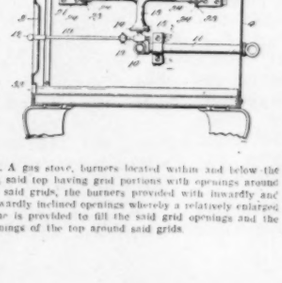
A gas igniting device comprising in combination a body having the shape of a pistol, a friction wheel arranged turnably at the muzzle of the barrel, a trigger pivoted within the barrel, a reciprocating member connected movably with the said trigger and provided on its under surface with an adjacent cam, a curve-shaped projection forming the said cam, an oblique sliding surface on the upper side of the said reciprocating member, a pin adapted so as to bear against the said sliding surface of the said reciprocating member, a sliding member arranged within the barrel and connected on the one end with the friction wheel and on the other end with the trigger, a spiral spring connecting the trigger and the said sliding member, a sharp edge provided on the rear upper end of the sliding member, a stop member attached behind and above the said sliding member, a tapered recess forming two shoulders and arranged in the said stop member.

1,660,018. GAS BURNER. ADOLF STEFFEN, Pittsburgh, Pa., assignor to Adams Brothers Manufacturing Company, a Corporation of Pennsylvania. Filed Apr. 9, 1925. Serial No. 21,817. 7 Claims. (Cl. 158—99.)



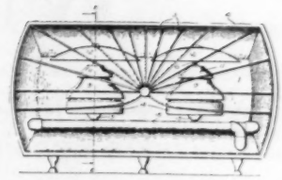
1. In a burner assembly for gas heaters, the combination with an intake pipe, and a receiving chamber connected therewith and having a plurality of burner nozzles thereon, of a vertical baffle located adjacent to the entrance of said receiving chamber for effecting uniform distribution of a gaseous mixture to said nozzles, and a vertically depending lug in the chamber, between the first two burners.

1,648,789. GAS RANGE AND BURNER THEREFOR. ARTHUR STOCKSTROM, St. Louis, Mo., assignor to American Stove Company, St. Louis, Mo., a Corporation of New Jersey. Filed Oct. 4, 1926. Serial No. 139,409. 18 Claims. (Cl. 126—39.)



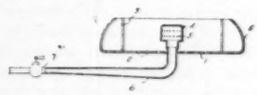
1. A gas stove, burners located within and below the top, said top having grid portions with openings around the said grids, the burners provided with inwardly and outwardly inclined openings whereby a relatively enlarged flame is provided to fill the said grid openings and the openings of the top around said grids.

1,618,169. GAS HEATER. ALBERT T. BROCH, New York, N. Y. Filed Oct. 30, 1924. Serial No. 746,888. 4 Claims. (Cl. 126—86.)



1. A gas heater device, which comprises a burner tip like burner having apertures in its upper surface, a stem connected to said burner projecting upwardly thereof, a bell shaped mantle on said stem above the burner said mantle having a lower edge of a diameter considerable greater than the diameter of the burner, the upper surface of said mantle being apertured to permit the heat and flame to pass therethrough, and a hood on said stem above the mantle adapted to trap the unburned gases and complete their combustion and to deflect the heat and flames downwardly over the surface of the mantle, and a reflector plate disposed at the upper end of the stem to distribute and deflect the heat as it rises from the burner and the mantle outwardly into the lower portion of the room.

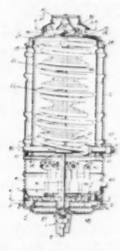
1,644,505. GAS BURNER. WILLIAM AUSTIN BECKETT, Kingsville, Ontario, Canada. Filed Oct. 14, 1926. Serial No. 141,529, and in Canada Mar. 29, 1926. 5 Claims. (Cl. 158—99.)



2. A gas burner comprising a hollow burner tip having a closed top and lateral perforations and adapted for connection with a gas supply pipe, a perforated base plate having a central opening for the passage of the gas supply pipe and an upstanding cylindrical deflecting wall member concentric with the burner tip and within the reach of the burner flame and having the lower edge connected with the base member and its upper free edge lying in a horizontal plane slightly above the top of the burner tip.

1,618,434. WATER HEATER. HERBERT S. HOLBROOK, Kalamazoo, Mich., assignor to Ruud Manufacturing Company, Kalamazoo, Mich. Filed Aug. 28, 1925. Serial No. 53,075. 7 Claims. (Cl. 122—250.)

1. In a water heater, the combination of a base, a bottom casing section mounted on said base, a casing ring of cruciform cross section on the upper end of said bottom section, a top casing section removably mounted on said casing ring, a casing top having a central opening therein mounted on said top section, an inner wall having its lower end arranged within said casing ring and provided with a head resting thereon whereby said inner wall is removably supported, said inner wall having a top portion with an opening therein registering with said opening in said casing top, a coil provided with a centrally disposed return pipe horizontally disposed inlet and discharge pipes, a coupling connecting said discharge pipe to the lower end of said return pipe, said inlet pipe being connected to the lower end of said coil and being in area covered by said coupling whereby said pipes resting upon said casing ring constitute coil supporting members, a tie rod extending downwardly from said coupling through said base and having a nut on its lower end, said coil having a centrally disposed stud at its upper end, a spider on said stud engaging said opening in said casing top and inner wall top member, said stud being provided with a clamping nut for said spider whereby the parts are positioned and detachably secured together, and a burner arranged on said base, said tie rod being removable independently of said burner.



1,642,007. AUTOMATIC SAFETY GAS COCK. JOHN BALTHASAR and HERMAN GENTE, Jersey City, N. J. Filed Oct. 1, 1925. Serial No. 59,962. 1 Claim. (Cl. 251—164.)

The combination with a gas cock including a body formed with a longitudinal gas passage, and a rotary plug having a rigid handle extending laterally from one end thereof and adapted to project to one side of the body when the plug is positioned to close said passage, of a spring pressed latch bolt arranged longitudinally of the body and normally engaged with said plug to prevent rotation thereof from closed to open position, and a thumb lever operatively connected at its inner end with the latch bolt and projecting to the other side of the body, said thumb lever being arranged to be engaged at its outer end by the thumb of the hand grasping the plug handle and to be pushed thereby for release of the latch bolt, the thumb lever and the handle being movable in the same direction about their axes for releasing the latch bolt and opening the plug, respectively.

With *the* Metermen

Committee *on* Reference Handbook Appointed

BUSINESS transacted at the April 26th meeting of the Southern California Meter Association included the appointment of a committee which will head up the Association's new program of assembling a practical reference book for the use of meter men. Carl Brockman, Union Oil Company of California, is chairman of this committee, other members being B. M. Laulhere, Southern California Gas Company, H. E. Thompson, Los Angeles Gas & Electric Corporation, and T. T. Gill, Union Oil Company of California. The object of this committee's activity will be to bring a large number of association members into specialized work on practical phases of fluid measurement, such as gauge calibration, running of specific gravities on wet and dry gases, use of straightening vanes, orifice meter gauge piping, length and size of gauge lines, orifice meter chart calculations, and many others. Small groups will work on these individual topics and their efforts will be reflected in papers delivered before the Association after approval has been given them by the board of directors. These papers will be briefed and, accompanied by pertinent diagrams, will be printed on Lefax forms to be assembled in a pocket size binder which the members of the association and others interested may keep for practical reference use.

Program features of the April 26 meeting, which was held at the Los Angeles Gas and Electric Corporation cafeteria, included L. C. W. Des Brisey's paper on "Tubes and Plates for Orifice Meters". Discussion following this dealt with the accuracy of internal diameters of meter tubes and its effect on gas measurement from viewpoints both of the meterman and the manufacturer. S. W. Borchers of The Bristol Company, gave a paper on "Recording Pressure Gauges and Thermometers", and illustrated it with a display of thermometer bulbs, flexible tubing, gauges, pens, pressure elements, etc. His remarks on checking recording or indicating thermometers for accuracy were particularly interesting.

More Golf Planned

Success of the Southern California Meter Association's first "blind-bogey" golf tournament, held Sunday, April 22nd at the Rio Hondo Golf Club, has encouraged association golfers to make these affairs a monthly occurrence, the next to be played on May 20th.

Twenty-seven registered for the first tourney, though only 19 appeared for play. An associate member of the association very kindly donated one and a half dozen golf balls which were split into three qeual prizes, all of which were spoken for by representatives of the Industrial Fuel Supply Company. A. G. Lindell, M. C. Waugh, and President T. K. M. Smith stepped into the money on this occasion, and they bring convincing proof that there was no collusion or false practices in the drawing. At any rate, a good time was had by all, and gross scores ranged all the way from 87 to 118. Prizes were awarded at the regular meeting of April 26.

Recording Pressure Gauges *and* Thermometers

By F. W. BORCHERS

*The Bristol Company**

THE general purpose of this talk is to present some of the details of the principles of operation of recording thermometers, together with the advantages and limitations of the various types now offered for commercial use. It is our purpose to emphasize the more important considerations in the proper selection and use of instruments for particular applications.

The operation of a recording thermometer is fundamentally the same as that of a recording pressure gauge. In general, the working element is a helical metal tube closed at one end and coiled. Pressure is admitted to the inside and when exerted, has a tendency to uncoil or straighten the tube. In the case of the working element of a recording thermometer, pressure is supplied by the expansion of some material, either a solid, liquid, vapor or gas, which is in a closed system extending from the recorder through a connecting capillary tube to a sensitive bulb which is located at the point where the temperature is to be taken.

Recording thermometers may be classed into three broad groups:

First, those operating on the expansion of metals—which group includes the bi-metallic spirals and those operating on the expansion of a liquid.

Second, the vapor tension type.

Third, the gas-filled type.

For this discussion we will group the bimetallic and liquid filled together, because of the similarity of temperature ranges for which they are used.

BI-METALLIC TYPE

This group is used principally for measuring within the range of atmospheric temperatures, and when the fluctuations in the temperature are not very rapid. They are, therefore, classed as a self-contained type, the entire instrument being subjected to the effect of the temperature variation. Obviously, the uses of this type are very limited.

The recording thermometer operating on the expansion of a liquir covers a somewhat larger range of temperatures, usually from minus 40° Fahrenheit to about 120° F. It permits of the use of a tubing extending from the instrument to a sensitive bulb, which is located at the point where temperatures are to be taken. The liquid used in this particular kind of an instrument is either an alcohol or turpentine, depending on the scale range of the chart. This is far more sensitive than the metallic type but it, too, is limited in its applications. It is necessary to restrict the limit of the length of the connecting capillary tubing because variations in temperatures along the tubing will seriously affect the reading of the instrument. An increase in temperature at any point along the capillary will result in expansion of the liquid within. As the system is a closed one, the increased expansion or pressure can only exert itself upon the working element, and is there registered as an increase in temperature at the bulb. This error cannot be compensated for It is important, therefore, to know when calibrating the instrument what temperatures are to be expected along the tubing at all times, and to keep the tubing at that temperature when it is in actual use.

The chart that is taken on this type of thermometer has uniform scale graduations, thus permitting of as accurate readings at one point along the scale as at another.

In practice, we like to limit the use of this type to below 100° F. and the length of tubing to approximately three feet—although satisfactory results are being had with as much as 10 feet.

VAPOR TENSION TYPE

Under Class 2 we will consider the vapor tension type instrument. Here we have a closed system in which the bulb is partially filled with a liquid. As the temperature rises a vapor is generated which builds up a pressure which is transmitted to the pressure element by means of a capillary tube. This expansion follows the law of the expansion of vapors and gives an increasing scale. The higher the temperatures, the greater is the pressure per unit increase in temperature. This is not a disadvantage by any means, for it permits of the use of a chart which has very wide and open graduations at the working range, and smaller graduations at the inside of the chart. The usefulness of this type then depends largely on the proper selection of the instrument.

The vapor tension type thermometer is exceedingly sensitive, recording the slightest variations immediately as they occur The time lag is negligible.

Besides considering the proper range for this type of instrument, it is also necessary to know the relative positions of the bulb and the instrument. If the bulb is to be located 20 feet above the recorder that fact must be stated when ordering the instrument. If it is to be 10 feet below or on the same level, that fact must be known for the proper calibration of the instrument. The reason for this is readily seen. We start with the bulb partially liquid filled. It is heated and vapors form and are transmitted to the instrument. If the temperature decreases with the bulb above the instrument, some of the vapor in returning to its liquid state remains in the capillary and acts as so much head of liquid on the pressure element. This condition must be taken care of. Once the proper calibration is made, however, the reading of the instrument is absolutely dependable.

In this type of thermometer it is also necessary to know what the temperatures

*Presented before the Southern California Meter Association, April 26, 1928.

will be along the capillary tubing. It is obvious that if the temperature is higher along the tubing than at the bulb the vapor will continue to expand and the recorder will actually indicate the temperature at the hottest point along the system rather than at the bulb. If the variation along the tubing does not exceed by 40 degrees the temperature at the bulb, the instrument may be properly compensated to care for such a condition. This type of instrument, however, is never recommended if the bulb is to be continuously at the lowest temperature of the system.

By the same token, a vapor tension thermometer can never be used for getting average temperatures, as in kilns, ovens, and so on. It will record only the highest temperature along the length of the bulb. When average temperatures are desired, the use of the gas-filled instrument, about which we will say more immediately, is recommended.

In short, then, the vapor tension instrument is limited in range from atmospheric to 500 degrees F.—it has an increase in scale of chart—requires a fixed relative position between the bulb and the working element—and permits of a limited temperature variation along the connecting capillary tubing.

THE GAS-FILLED INSTRUMENT

Under Class 3, we find the ideal thermometer, namely, the gas-filled instrument. This thermometer operates according to the law of expansion of perfect gases. The gas used is usually a nitrogen, the capillary being filled under pressure and sealed. The result is a straight line curve and a uniform chart graduation. This type of instrument may be used for any range of temperature from refrigeration to flue gas temperatures—from minus 60 to as high as 1000 degrees F. The readings are independent of the relative positions of the bulb, and the accuracy of the readings is not affected by changes of temperature along the tubing. We say the *readings*—not the instrument. Of course, an increase of temperature along the capillary should theoretically and does actually cause an expansion of the gas in the tubing. However the bulb is so designed that there is a definite ratio between the volume of the bulb and the volume in the capillary. The volume of the bulb is so great in comparison to that of the capillary that any increase in pressure due to an increase in temperature at any point along the connection tubing will be absorbed in the relatively large volume in the bulb and never reach the working element. Theoretically, there will be an increase all along the line, but that increase is so small that it will not be readable on the chart.

Here then we have as nearly perfect a thermometer as possible for an instantaneous accurate recorder. The bulb is usually slightly larger than those used in the preceding types, but a suitable bulb can almost always be found; if the standard bulb is too long, the diameter may be increased and the length decreased.

It is always desirable to consider all of the possible working conditions before selecting any particular instrument. Oftentimes a vapor tension type thermometer will serve to better advantage than any other, but unless one is sure of his ground, it is a mistake to select it from a catalog Our own experience along this line with one of the major oil companies in this territory proved this to us conclusively. This company had been using vapor tension instruments for some time in its gas department. For high ranges, one chart was used and for low temperatures an entirely different one was used. By re-standardizing these into gas filled instruments with uniform charts, it was possible to use a single chart—making all of the instruments interchangeable and reducing the number of charts and parts to be carried in stock to a minimum.

There is no set rule to offer in this matter. One department of one company may benefit most by using one type, while another will get best results from a different type of instrument. We do feel, however, that the matter is important enough to warrant serious consideration by those men who use this class of instrument to any extent. Any one of the instrument companies will be glad to co-operate in the proper selection of thermometers and give the benefit of its experience in other fields.

BULBS

Having determined the temperature ranges of the instrument required, and the type of instrument suited to the application, the next consideration is the type of bulb needed. In general, these may be divided into four groups:

First, the plain bulb for use in free open spaces as in ovens, kilns, etc.

Second, bulbs with pipe-thread connections. These are used chiefly in closed spaces under pressure, as in pipe lines, tanks, vats, etc.

Third, bulbs with separable sockets. It is often desirable to install a socket permanently in a line and still be able to remove the bulb and thermometer without interfering with the operations of the apparatus.

Fourth, specialized bulbs designed for particular applications. For example, the averaging bulb referred to earlier in this paper and bulbs for use in digesters, tanks, etc.

Not only must we think of a bulb which will fit into the space available, but also of the mechanical and chemical reactions which it must stand. The variety of metals user in bulbs covers a wide range. They may be made of copper, bronze, brass, steel, monel, cast iron, or ambrac metal—nickel, silver or gold-plated, tinned, lead covered and so on, depending on the service for which they are to be used.

General practice in installing bulbs is to have them in and along the line of flow of the fluid whose temperature is to be measured. This is particularly true when the fluid is under pressure, in order to minimize the mechanical stresses on the bulb tending to bend or break it. It should also be remembered that the temperatures in dead areas, as a rule, do not give the actual and working temperatures of a liquid or a gas. It is necessary to insert the bulb where there is some circulation and expose as much of the bulb as is sensitive Bulbs are usually marked to indicate their sensitive areas, which may be along their entire length or portions at their tips.

What has been said concerning bulbs is equally true about the connecting capillaries. These are furnished with flexible bronze or steel armor, or they may have bendable steel or soft annealed copper tubing, lead covered, nickel plated or tinned, depending on the application.

Speaking generally again, the simplest equipment which will do the work is the most practical, because it is easiest to maintain in operation. Examination of the instrument shows that in every case the pen arm is connected directly to the pressure element without the use of gears, links, levers, ratchets or multiplying devices The movement in the working elements caused by the changing temperatures at the sensitive bulb is transmitted directly to the chart. As a rule, the plain pen arm is furnished, eliminating the possibility of inexperienced persons throwing the instrument out of calibration Where desired, however, these pen arms can be furnished regularly with micrometer adjusting screws. Fountain pens may replace the V pens and are interchangeable with them. The working elements themselves are all interchangeable. For example, if it were necessary to change the working system of one gauge to that of another, it could be done in a very short time. We speak, of course, of similarly modeled instruments. The element in a 12-inch pear-shaped gauge will of course not fit an 8-inch round form instrument, but any definite sized model instrument will permit of interchangeability of elements with others of that same model.

The clocks used in these instruments are also interchangeable. They are of standard make, and have a removable main spring which can be taken out of the clock and replaced without removing it from the instrument.

Where desired, these instruments may be furnished with electric clocks operating either from a master clock or directly from a lighting circuit. The advantage of the electric clock is that a whole battery of instruments can be kept at exactly the same time positions throughout the day or week.

The entire instrument is housed in a special case. There is a case for almost every application, ranging from the light wood or aluminum portable cases, to the cast iron water tight cases for underground installation.

All through this paper we have spoken of single pen instruments recording on circular charts. What has been said concerning them applies equally to the multiple recorders and to the strip chart type of instruments. The round chart offers a compact, easily filed record of conditions, whereas the strip chart is used where a wider scale, and its accompanying greater accuracy, is needed.

Automatic electric alarms and long distance outfits operating over several hundred feet or several miles are also available in connection with these thermometers.

Tubes *and* Plates *for* Orifice Meters

By L. P. W. Des Brisey

*Los Angeles Gas and Electric Corporation**

ONE of the most important factors to be considered in the erection of an orifice meter set-up is the selection of suitable tubes. Any error in the internal diameter of these will be reflected in the gas measurement as long as the meter is in service, which is in many instances a period of years

After calibrating the tubes in many meter set-ups which have been in service for a very long time, we have found that the average constant error in gas measurement due to wrong sized tubes will be 0.5 per cent plus or minus. This is usually lower in the pipe sizes below six inches and higher in the larger size pipes. We have found eight- and ten-inch tubes which were in error from 0.8 per cent to 1.0 per cent. In one instance an extra-heavy 10-inch tube on the upstream side was used with a standard

*Presented before the Southern California Meter Association, April 26, 1928.

10-inch tube on the down stream side and from actual tests this set-up was found to be in error 1.5 per cent.

I think that most of these errors in meter set-ups were due to the fact that it was generally taken for granted that two standard pipes would have a uniform internal diameter, which is far from correct.

In most pipe sizes used in orifice meters and especially in the 8, 10 and 12-inch sizes, which are used on a majority of the main gas lines, there are two or three standard sizes which differ considerably in internal diameter. The published coefficients, on the other hand, are based only on one standard internal diameter for each size.

It is much easier to take a little time when a meter is being installed to select the pipe size which agrees with the published coefficients, than to compute a special coefficient, although the latter would be preferable to the constant error in measurement which would otherwise result.

In the 12-inch standard size pipe the coefficients published are based on an even 12 inches internal diameter. Because of the difficulty of finding pipe in this size locally, it was necessary to take the 12.09 size and compute special coefficients.

In the 16-inch size I have found it practically impossible to get tubes even close to the standard size of 15.250 inches.

The internal diameter of eleven 16-inch meters of the Los Angeles Gas and Electric Corporation averages 15.380 inches, a difference of .130 inch.

In calibrating pipe for orifice meters it has been our practice to first select a pipe which is smooth and free from burrs and ridges on the inside, then to measure the internal diameter at four points equidistant from each other. If the pipe is fairly round and the average of the four measurements is within .005 inches for the smaller pipes, or .010 inches for the larger pipes, of the standard size, it is considered satisfactory.

We have found that as a general rule a joint of pipe will be fairly uniform throughout its entire length, although it may be far from standard.

Sometimes it is a rather tedious job to pick two lengths of pipe from a shipment of pipe which are exactly suited for a meter, but if you consider that the meter will probably be in service for years and measure billions of cubic feet of gas, a constant error of 0.5 per cent will amount to a great deal of money.

Therefore too much care cannot be used in selecting tubes. Of course it is impossible to get a perfect tube from a pile of standard pipe, but by careful examination tubes can be found that will answer all practical purposes.

Following is a table showing the actual constant error in some of the tubes which have been in service for some time:

Size of Pipe	Size of Disc	Nominal I. D. of Pipe	Standard Coefficient	Actual I. D. of Pipe	Actual Coefficient	Per Cent Difference
4″	1.500	4.026	503.6	4.038	503.3	−0.060
4″	2.500	4.026	1802.9	3.840	1888.0	+4.720
6″	2.000	6.065	875.7	6.086	875.2	−0.057
6″	2.000	6.065	875.7	6.096	875.0	−0.080
8″	4.500	8.071	5356.7	8.014	5383.5	+0.500
8″	4.500	8.071	5356.7	8.022	5379.7	+0.429
8″	4.500	8.071	5356.7	7.785	5499.8	+2.671
10″	6.500	10.191	12502.1	10.038	12692.4	+1.522
10″	5.500	10.191	7830.1	10.044	7904.5	+0.950
10″	5.500	10.191	7830.1	10.065	7893.0	+0.803
10″	6.500	10.191	12502.1	10.103	12609.9	+0.862
10″	6.500	10.191	12502.1	10.139	12565.3	+0.506
12″	7.000	12.000	13402.8	12.090	13325.2	−0.579
12″	7.000	12.000	13402.8	12.167	13260.8	−1.059
16″	8.500	15.250	19108.1	15.380	18996.8	−0.582
16″	7.500	15.250	13819.5	15.380	13762.8	−0.410

There are three important items about an orifice meter disc. Aside from these it is only a matter of individual taste and preference whether to use a thin disc, a thick one counter sunk on both sides, or a thick beveled edge disc.

First: The upstream edge of the disc must be absolutely sharp and square.

Second: The diameter of the orirfice must be accurately bored to the proper size.

Third: The throat of the disc should be one-eighth inch through.

A very small bevel on the upstream side of the disc or a wire edge may throw the measurement off as much as four or five per cent. Great care should be taken in the transporting and storing of discs, so as to make sure that they do not get nicked or worn on the sharp edges. Also, discs in service should be examined regularly to make sure that the edges are in good condition and that no deposit has collected on them A dirty disc, on the upstream side of which a deposit has collected, around the edge of the orifice, is as bad for measurement as a beveled edge and will always result in a low meter reading.

Every disc should be accurate, as to the size of the orifice, to within a thousandth of an inch. This is not a difficult standard to follow, but is very important. Of course an error in the disc size in a small meter set-up is proportionately greater than the same difference in a larger set-up.

A discrepancy of five thousandths of an inch in a one-inch orifice, in a four-inch set-up causes an error of 1.036 per cent, while the same discrepancy in a three-inch orifice, in a 12-inch set-up causes an error of 0.35 per cent.

Following is a table illustrating percentages of error which may occur through use of discs of improper sizes:

Size of Pipe	Nominal Size of Disc	Hourly Coefficient	Actual Size of Disc	Hourly Coefficient	Per Cent Difference
4.026	1.000	212.4	1.001	212.9	+0.235
4.026	1.000	212.4	1.005	214.6	+1.036
4.026	3.000	3197.2	3.001	3200.8	+0.113
4.026	3.000	3197.2	3.005	3215.3	+0.566
8.071	2.000	849.6	2.001	850.5	+0.106
8.071	2.000	849.6	2.005	854.0	+0.518
8.071	6.000	12747.4	6.001	12754.7	+0.057
8.071	6.000	12747.4	6.005	12783.3	+0.282
12.000	3.000	1912.8	3.001	1914.2	+0.073
12.000	3.000	1912.8	3.005	1919.5	+0.350
12.000	9.000	29034.8	9.001	29045.5	+0.037
12.000	9.000	29034.8	9.005	29089.8	+0.189

All discs should have a throat one-eighth inch through, as our original coefficients were calculated from discs of this dimension. The latest reports from the Natural Gas Department, A. G. A., committee which is running experiments at Buffalo are that the thickness of the throat of a disc has slight influence upon the differential.

There has been little work done as yet to determine the best flange for orifice meter use. It seems largely a matter of selecting the flange best suited to do the work of each individual meter set-up. We use all kinds of flanges and as far as measurement is concerned there seems to be little choice for accuracy.

There is one big advantage, however, in having one style of flange for all meters and that lies in the smaller stock of discs that must be carried.

Important Action Taken *at* Norman Meetings

ONE of the features presented to the metermen for adoption at the Fifth Gas Meter Short Course in session April 24, 25 and 26 at the University of Oklahoma, Norman, Okla, was the formation of an Approved Methods Committee.

The recommendation that such a committee be formed was presented to the metermen by the technical committee which was recently established for the purpose of investigating some of the varying methods of making tests and adjustments as used by some of the companies.

The function of the Approved Methods Committee is not to "formulate methods that must be used but rather to approve any method or methods that are considered as correct."

Representatives from companies that are buyers and sellers of natural gas and casinghead gas will compose the committee.

The June issue of *Western Gas* will carry a complete story on the Meter School, together with some of the papers read before the assembled metermen.

DES MOINES COMPANY SOLD TO IOWA POWER & LIGHT

L. C. Leland, general manager of the Iowa Power & Light Company, which controls the Des Moines Electric Company, announces that his company has purchased the Des Moines Gas Company, held by the United Gas & Improvement Company of Philadelphiaphia, consolidation of the two companies to become effective immediately. H. R. Sterrett continues as operating manager of the Des Moines Gas Company, with Mr. Leland as vice-president and supervising manager Gas is supplied to Des Moines and Valley Junction by the Des Moines Gas Company.

FORT MADISON COMPANY ADDS WATER GAS MACHINE

The Fort Madison Gas Light Company, Fort Madison, Iowa, has purchased from the Semet-Solvay Engineering corporation of New York a Steere six-foot water gas machine. New plant piping and improvement of plant apparatus are included in the contract.

D. H. Perkins, superintendent of the San Diego Consolidated Gas and Electric Company's gas distribution department, recently presided over a "Gas Day" luncheon meeting of the San Diego Electric Club. An argument on gas versus electricity in the form of a skit written by Ray Edwards of the gas distribution department, and an address by J A. Harritt, superintendent of the gas production department, on the subject of "How We Make Gas," featured the program.

HENRY C. MORRIS ADVANCED TO DALLAS PRESIDENCY

AT a meeting of the Dallas Gas Company board of directors, held in Dallas on Tuesday, April 24, Henry C. Morris, vice-president and general manager of the utility, was advanced to the presidency, succeeding W. V. M. Towelson, of New York. R. G. Soper succeeds Mr. Morris as vice-president. According to Mr. Morris no change in company policy is contemplated.

During the last 30 years Mr. Morris has made consistent steps towards his present deserved post, beginning his connection with the gas industry as a meter repairer in the shop of the Detroit City Gas Company. He went next to the Saginaw, Michigan, Gas Company as superintendent of construction, and three years later to Bay City, Michigan, as assistant general manager of the Power & Light Company. Coming to Dallas in 1909 as superintendent of operation and construction for the Dallas Gas Company, he served until 1912 when he was made vice-president and general manager. He is now vice-president of the Fort Worth Gas Company in charge of operations. He has been prominently identified with natural gas development projects in the Southwest, and is chairman of the arrangements committee for the forthcoming natural gas convention at Dallas.

HELP DOMESTIC GAS USERS TO GET MOST FROM FUEL

"Getting the Best that Gas Can Give You" is the title of a handbook of helpful suggestions for domestic gas users issued recently by the Southern Counties Gas Company, Los Angeles. The housewife is advised on meter reading, gas range operation and burner adjustment, and proper care and use of other gas burning appliances, and is given useful information on modern cooking practice.

KILLED IN AUTO CRASH

Alan I. Openshaw, gas inspector of the Union Oil Company of California at Maricopa, was instantly killed and F. M. Penter, superintendent of the Company's Northern Gas Division fractured his left collar bone in an automobile accident on March 25th, 1928, ten miles east of Santa Maria.

PRODUCTION CONFERENCE

May 22, 23 and 24 will be held the Second Annual Production Conference of the carbonization, chemical, and water gas committees of the American Gas Association, headquarters to be the Hotel Senesa, Rochester, N. Y. An attendance of more than 300 is expected.

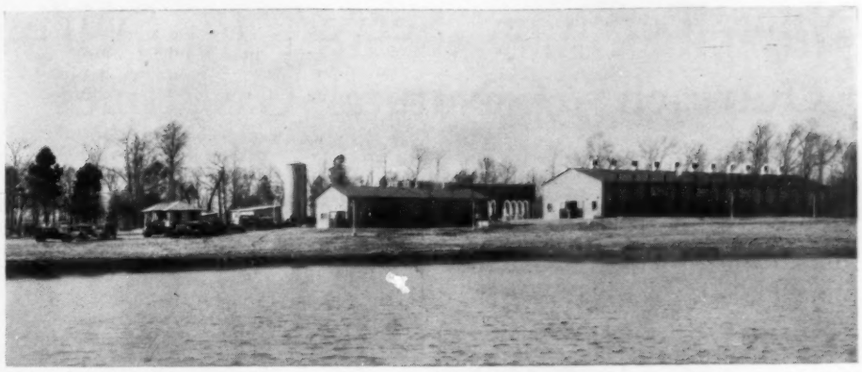
SOUTHERN SAFETY MEET

Arrangements have been made for holding the First Annual Gulf States Safety Conference at New Orleans on Thursday, May 24, according to the National Safety Council.

POTTER DUE ON COAST MAY 5

Clyde H. Potter, general commercial agent of the Southern Counties Gas Company, Los Angeles, returns on May 5 from a five-week tour, during which he visited commercial departments of leading gas utilities in Middle West and East, the American Gas Association Laboratory at Cleveland, A. G. A. headquarters in New York, and all factories of appliances handled by the Southern Counties.

The Homestead Heater Company of Newark, N. J. announces the appointment of Graham Hambly & Son as distributors for California and Arizona.



General view of Dixie Gulf compressor station

The New Dixie Gulf Line

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contracts, some of which are now being signed, will probably compel the company to install a large compressor station at some point on the main line by the time cold weather arrives.

COAST COUNTIES HAS GOOD ANNUAL REPORT

The 1927 operating revenue of the Coast Counties Gas and Electric Company which has headquarters in San Francisco, was reported at $1,796,979.05 as compared with $1,616,534.79 for 1926. Net operating revenue increased about $56,000.

NEXT PETROLEUM EXPOSITION IN TULSA, SEPTEMBER

On April 14 directors of the International Petroleum Exposition voted to hold the Exposition sometime the coming September in Tulsa. W. G. Skelly has been re-elected president of the Exposition, which will be held annually hereafter if present plans materialize.

FIGURES ON GASOLINE PLANTS IN UNITED STATES

ON January 1st, 1928, according to a survey made by the United States Bureau of Mines, natural gasoline plants in the United States numbered 1155 with one small plant in Alaska. Of these plants 1060 or 92 per cent were in operation on that date, leaving 95 or 8 per cent inoperative. The total plant capacity was 8,048,000 gallons per day of which only 294,000 gallons or four per cent was shut down on January 1st.

Oklahoma leads the states in natural gasoline production, with a total of 331 plants, with California and Texas following. In addition to the states named plants are located in Arkansas, Colorado, Illinois, Kansas, Kentucky, Louisiana, New Mexico, New York, Ohio, West Virginia and Wyoming.

A total of 526 plants with a capacity of 5,476,000 gallons use the absorption process, and 497 plants with a 1,398,000 gallon capacity use the compression process; 105 plants use a combination of processes, and 27 plants with capacity of 214,000 gallons use the charcoal process.

Information circular 6062, "Natural Gasoline Plants in the United States" by G. R. Hopkins and E. M. Seeley, contains the results of this Bureau of Mines survey.

Wyoming Natural Gasoline and Carbon Black Plants

WYOMING plants engaged in the recovery of gasoline from natural gas, including their capacity output in gallons, and plants built for manufacture of carbon black are listed as follows by the state oil inspector:

GASOLINE PLANTS

Firm	Location	Type	Gallons Capacity
Midwest Refining Co.	Salt Creek	Compression	60,000
Midwest Refining Co.	Elk Basin	Compression	1,500
Ohio Oil Co.	Grass Creek	Compression	6,000
Ohio Oil Co.	Lance Creek	Absorption	6,000
Ohio Oil Co.	Salt Creek	Compression	10,000
Carter Oil Co.	Salt Creek	Compression	10,000
Producers & Refiners	Casper	Absorption	7,000
Producers & Refiners	Riverton	Absorption	1,000
Continental Oil Co.	Rock River	Absorption	4,000
*New York Oil Co.	Teapot Dome	Compression	1,500
*Standard Engineering Co.	Casper	Absorption	5,000
			112,000

*These two plants will probably be shut down indefinitely as they are operating on Teapot Dome gas.

CARBON BLACK PLANTS

Location	Firm	Capacity	Production per 1,000 ft.	Status
Lance Creek	J. M. Huber Co.	7,000,000	1.8	Operating
Crowley	Preston, et al.			Shut Down
Golden Eagle	Wilson, et al.			Shut Down
Riverton	Teton Gas Prod. Co.	6,000,000	1.8	Operating

New Territory Served *in* Swift Outreach *of* Natural Gas Lines

(Continued from Page 39)

pany constructed 76 miles of line in 1927 and added three towns to its system. A total of 4,530 customers are served.. The principal towns on the line are Cuero, Yoakum, Gonzales, Stevensville and Cross Plains.

WEST TEXAS PROJECT

One sizeable gas line project which was put in motion last year is that of the West Texas Gas Company of Amarillo, a Prairie Oil and Gas Company subsidiary which operates 236 miles of gas line, serving a total of 15 towns. The main transmission line begins at the Amarillo fields and extends in a southerly direction to Slaton, Texas. All of this 236 miles of line was laid in 1927 and 130 additional miles are planned for 1928. These additions will extend from the main line from Lubbock and from Slaton to Post. Fifteen towns are now served by this company.

Rio Grande Valley Gas Company operates 286 miles of line, all laid in 1927, the main system extending from the northwest corner of Jim Hogg county, Texas, and ending at Brownsville, Cameron county. This company now serves 12 towns, having 2500 domestic customers and 125 industrial consumers. The size of the existing line ranges from two to 12 inches. Some of the major industries served are irrigation pumping plants, electric power plants, brick yards, laundries, canneries, and hotels.

The Stamford and Western Gas Company of Stamford, Texas, supplies gas to 20 towns in Northern Texas. Chillicothe is the beginning point of the line, which runs almost due south through Stamford and then extends westward to Rotan, its terminus. Twenty miles of 8-inch line were laid in 1827 with a total of 130 miles of main line and 105 miles of laterals being planned for this year. The number of industrial consumers served are 180, with 6,000 prospective domestic consumers. Some of the industriese served are gins, compressors, oil mills and brick and tile plants.

Western Gas Service Company of San Angelo, Texas, operates 200 miles of line, this having been constructed in 1927. Four towns, with approximately 2500 gas customers, are served, the communities being Bullinger, Miles, Rowena and San Angelo.

The Austin Gas Company operates 20 miles of high pressure system and 80 miles of low pressure. Its distribution system is limited to the city of Austin, where it serves 6500 domestic consumers and 40 industrial users. About 10 miles of this line were constructed in 1927 and approximately 20 miles of line ranging from four-inch to 10-inch are planned for 1928

MUCH LOUISIANA ACTIVITY

Another feature in this issue covers the major gas activity in Louisiana, and the following additional facts are of further interest:

The Southern Gas Line, Inc., of Monroe, Louisiana, a subsidiary of the Columbian Carbon Company of New York, operates 105 miles of 12-inch line from Fairbanks, La., to Alexandria, and 17 miles of 8-inch line from Fairbanks to Monroe. This company sells gas at wholesale only, the Pineville Gas Company, Inc., another subsidiary of the Columbian Carbon Company, being one of the distributors. Other distributors are located at Monroe, West Monroe, Rochelle, Alexandria, and in eleven other cities and towns. During 1927 several small medium pressure systems were taken over and plans are under way to further increase the system in 1928. The total number of domestic consumers served are 10,990 with the industrial users numbering 90. Some of the principal types of industries served are city water plants, light and power plants, brick plants, ice plants, creosoting plants, cotton seed oil mills, ice plants and meat packing plants.

Belchic and Laskey, Inc., of Shreveport, Louisiana, operate the Northwest Louisiana Gas Company and the Peoples Gas & Fuel Company with headquarters at Shreveport. One hundred and eighty miles of line are operated and 12 towns served. The source of supply is the Sarepta Gas Field and the Monroe Gas Field. Thirty miles of this line were laid in 1927 and seven towns were added to the system in the same year. Twenty-two miles of line will be constructed in 1928, extending from Ruston to Arcadia. The Northwest Louisiana Company serves 75 industrial and 250 domestic consumers. The Peoples Gas & Fuel Company serves 50 industries and 3000 domestic consumers. Types of industries served are oil companies, cotton gins, ice plants, railroad shops and brick plants.

375-MILE BELCHIC & LASKEY

Belchic & Laskey, Inc., also expect to project a natural gas system from the Richland Parish Gas field to cities and towns in south and central Louisiana. Completion of the system is anticipated by fall of 1928 Surveys and necessary plans for the town plants are well under way. The main line will total 375 miles approximately, and will consist of 200 miles of 16-inch line, 100 miles of 12-inch, and 75 miles of 8-inch.

The lateral line will total 165 miles approximately, and will consist of 8, 6, 4 and 3-inch pipe. The gathering system in the Richland Gas field will require some 50 miles of 4-inch pipe. A 35 million cubic feet gasoline plant will be erected in the gas field.

The project contemplates the installation of distribution systems in some 60 odd cities and towns located in 20 parishes and will enjoy 25-year franchises, which have been granted. The region to be served, known as the Acadian Country—picturesque in the annals of American Colonial history and tradition—has been for years the main sugar cane, rice and sulphur producing area in the U. S. A. It is called the Sugar Bowl of America. All of the large mills in the sugar, paper, salt, rice, cellulose, tobasco sauces, fisheries, gravel deposits, cotton gins and oil mills, brick plants, lime plant, and numerous other industries will be users of large quantities of natural gas for fuel.

The Magnolia Gas Company, of Dallas, a subsidiary to the Magnolia Petroleum Company, is soon to begin the construction of extension lines in Northern Louisiana from the Cotton Valley district to the gas area in Richland Parish, where it has contracted for a big volume of gas. This line will be 106 miles in length and will greatly increase the supply of gas available to industrial users at Fort Worth, Dallas and Beaumont. The line will be composed of 16, 18 and 20-inch pipe. The extension line will connect with the original system at Serepta Station, Webster Parish, and will be completed by August. One field booster station will be built several miles north of the town of Alto, and a second station near Sterlington.

It is also reported that the Magnolia interests plan to build a 350-mile gas line from the Texas Panhandle through the Sayre and Chickasha fields of Oklahoma, to connect with the company's system now ending at Fort Worth.

Approval for a $13,000,000 bond issue has been given to the Arkansas Natural Gas Company by the Arkansas Commission. This company has been recently merged with others into the Southern Cities Distributing Company. It is understood that the bond issue is to make possible certain extensions which were contemplated before the merger of the companies.

A 40-mile line from Texarkana, Ark., to De Queen and Mena is one of the extensions, while another is a line from Clarksville, Ark., to Little Rock, which has been planned by the Public Utilities Company of Arkansas, a Doherty property. Another extension, it is understood, is a line from Little Rock to Memphis which the Arkansas Natural had in mind before the merger. Another extension anticipated is an addition to the Richland-Camden line of the Natural Gas & Fuel Co. This line will probably be extended from Camden or El Dorado to a compressor station located a few miles south of Prescott, Arkansas, on the Caddo Parish-to-Little Rock line of the Arkansas Natural Gas Company.

The newspapers of Memphis, Tenn., state that plans have been concluded for the serving of natural gas to Memphis through a line from Louisiana. According to the report, the Memphis Power & Light Company and the Doherty interests have come to terms, making the line possible. The Memphis Natural Gas Company is an outgrowth of this agreement and it is reported that the Louisana-Memphis line will be constructed by them at a cost of $8,000,000.

With the bond issue already authorized, however, for the construction of a line from Little Rock to Memphis by the Arkansas Natural Gas Company, one of the interests merged into the Southern Cities Distributing Company in which the Doherty interests are associated it would seem likely that this would be the source of the gas supply to Memphis.

TO HANDLE HEAT TRANSFER EQUIPMENT SALES

The Heat Transfer Products, Incorporated, a division of the Staten Island Ship Building Company of New Jersey, has recently contracted with the Jackson Engineering and Equipment Company to handle all sales of Heat Transfer Equipment to the natural gas, natural gasoline and petroleum refining industries in the Mid-Continent and Southwest.

The Jackson Engineering Company operates offices in Los Angeles, Tulsa and Dallas, making a specialty of gasoline absorption plants and heat transfer equipment.

They have recently obtained orders for absorption and distillation units for the Pine Island and Sarepta Plants of the Magnolia Gas Company, the Lefors plant of the Coltexo Corporation, a tail gas plant for the Standard Oil of New Jersey at their Bayway refinery, and the absorption plant which the Colorado Interstate Gas Company is installing at Channing, Texas, to strip the gas going through the Panhandle-to-Denver line.

1928 Calendar

Southwest Public Service Association—Dallas, Texas, May 3-5.

Natural Gas Department, American Gas Association—Dallas, Texas, May 7, 8, 9, and 10.

Natural Gasoline Association of America—Tulsa, Oklahoma, May 22, 23, and 24.

Joint Production and Chemical Conference, American Gas Association—Rochester, N Y., May 22, 23, and 24.

Pacific Coast Gas Association, Northern Regional Conference—Vancouver, B. C., June 6 and 7.

Canadian Gas Association—Hamilton, Ontario, June 21 and 22.

Pacific Coast Gas Association, 35th Annual Convention—Hotel Coronado, Coronado, California, September 17 to 20.

American Gas Association—Atlantic City, N. J., October 8, 9, 10, 11 and 12.

MONTANA-DAKOTA GAS CARRIER NEARS ACTUAL LAYING

Application with the North Dakota Railway Commission has been made by the Montana-Dakota Power Company for permission to lay a $3,800,000 pipe-line across North Dakota from Beach to Fargo, and at the same time the Central West Utilities Company is asking permission to lay distributing systems in 27 cities and villages between Beach and Fargo.

Montana-Dakota Power Company has secured gas franchises at Deadwood, Lead, Sturgis, Belle Fourche, and Spearfish, the Black Hills country of western South Dakota, and plans to lay a 175-mile gas pipeline from the Cabin Creek field near Baker, construction work to be handled by Hope Engineering & Supply Company. The Montana-Dakota Power Company has 80,000,000 feet of gas at its command without drilling additional wells, with only 2,000,000 to 4,000,000 cubic feet now being sold.

GOVERNMENT CLOSES CONTRACT FOR HELIUM

United States Bureau of Mines, Department of Commerce, has closed a contract with the Amarillo Oil Company of Amarillo, Texas, under which the Bureau will extract helium from that company's leases on the Cliffside structure in Potter County, Texas, through a helium plant to be constructed by the Government at Amarillo.

LASKEY IS SOUTHWEST GAS UTILITIES CORP. HEAD

Charles G. Laskey has been elected president of the newly formed Southwest Gas Utilities Corporation, a consolidation of 15 companies in Louisiana, Oklahoma and Texas, controlling 50,000 acres of proven gas land with an open flow of 750,000,000 cubic feet a day and over 1,000 miles of pipe line transportation. In 1915 Mr. Laskey with George Belchic organized the firm of Belchic & Laskey, Inc., which laid the first pipe line through northwest Louisiana.

METER READERS BANQUET

Meter readers of the San Diego Consolidated Gas and Electric Company held their first get-togehter banquet during March, all but four members of the department being present. Meter reader banquets will be an annual affair in the San Diego Company henceforth.

Cleaning Pipe *by* Sand Blasting

(Continued from Page 51)

ADDENDA

1. MECHANICAL ANALYSIS

Identification:	*Sand A*	*Sand B*	*Sand C*
Passing 100 mesh	.....	1.0%	1.0%
Passing 80 mesh	1.0%	1.0%	1.0%
Passing 50 mesh	1.0%	1.0%	2.0%
Passing 40 mesh	3.0%	2.0%	6.0%
Passing 30 mesh	2.0%	12.0%	47.0%
Passing 20 mesh	30.0%	55.0%	36.0%
Passing 10 mesh	63.0%	28.0%	7.0%
Total	100.0%	100.0%	100.0%

2. CHEMICAL ANALYSIS

Identification:	*Sand A*	*Sand B*	*Sand C*
Silica, SiO_2	84.20%	94.62%	85.83%
Iron Oxide, Fe_2O_3	0.77%	0.18%	0.18%
Aluminum Oxide, Al_2O_3	9.33%	4.48%	8.72%
Calcium Oxide, CaO	0.36%	0.00%	1.25%
Magnesium Oxide, MgO	None	None	None
Sulphuric Anhydride, SO_3	None	None	None
Loss on Ignition	0.50%	0.45%	0.30%
MNO_2	None	Trace	None
Na_2O, K_2O	None	0.27%	None
Total	95.16%	100.00%	96.28%

Practical Use *of the* Indicator

(Continued from Page 52)

can supply it and gas is admitted through the intake valves to occupy this space. If leakage is very high the cylinder pressure may not fall to the intake pressure and no useful work at all will be done; in which case line d-s will be at some distance above the intake pressure, similar to the curved dotted line.

As mentioned above it cannot be positively determined from the appearance of lines s-d or the distance from s to c whether or not a discharge valve is leaking; however, in this card s-c and s-d appear to be longer than normal so the beginning of the compression or discharge stroke is inspected (Point S.) A slightly rounding point, indicating that the pressure was building up while the piston was at rest and also while it was moving slowly at the beginning of the stroke, completes the proof of discharge valve leakage.

In Card No. 3 we find d-s nearly vertical indicating that the gas in the clearance space escaped while the piston was at the end of the stroke. At this point of the cycle the opposite end has just completed the intake stroke so that that portion of the cylinder contains gas at intake pressure and the gas in the clearance space may escape either by the rings or through the intake valves. If it escapes by the rings it will increase the pressure on the opposite side of the piston, causing a slightly rounded point at S while if the intake valve is leaking the divergence of lines S-D and S-s at point S will be slower than normal because as compression takes place a part of the gas passes back through the intake valves; also, the two lines will practically coincide for a distance depending on the amount of leakage and the piston speed. The separation of the lines will also be slower if the rings are leaking, but with the difference that a slight immediate separation takes place at the end of the stroke (Point S). This may be confusing unless it is remembered that the ring leak is in all probability both ways and the rise in pressure at S is occasioned by leakage from the end opposite to that on which the diagram was taken.

The timing of mechanically operated intake valves may be such that the clearance volume expansion line is vertical or nearly so. However, it should not be vertical since the expanding gas does work on the piston and if allowed to escape into the intake line by too early opening of the intake valve, the work is lost, and the mechanical efficiency reduced accordingly.

Generally speaking, discharge valve leakage may be expected if the expansion line is too long, and intake valve or piston ring leakage if it is too short, but as pointed out above, other considerations must be made or an erroneous conclusion may be reached.

GAS VOTE AT THOMAS

Application of the Centralwest Gas Company for a franchise in Thomas, Oklahoma, will be voted on May 8th.

IDAHO FALLS UTILITY MUST CONTINUE IN BUSINESS

By decision of the Idaho Public Utilities Commission the East Idaho Gas Company, serving Idaho Falls, must continue business but will be allowed to increase rates, the new schedule allowing a $1.50 minimum. This entitles the customer to 800 cu. ft. of gas; the next 1200 cu. ft. cost $1.20 and the next 3,000 cu. ft. $1.00. The company is now being operated by Alvin Denman, receiver, and has been petitioning to discontinue service.

NAME STRICKLER TO HEAD CHARITIES DRIVE

Major T. J. Strickler, vice-president and general manager of the Kansas City Gas Company, has been named field marshall for the 1928 allied charities drive of Kansas City, Mo., to be conducted October 21 to 27.

Stage Set *for* Dallas Meeting

(Continued from Page 37)

Southern California Gas Company.

The afternoon session on Tuesday, May 8, will begin with a report of the Wrinkle Committee by H. J. Struth, Cincinnati, chairman. This committee has some startling revelations to make, and an unlimited stock of gas man's humor, as well as the more serious business of "wrinkles" on which to report.

R. W. Hendee of Tulsa will read a paper on "Employees' Performance in the Natural Gas Business," and T L. Phillips, Cincinnati, will discuss, 'Why a Gas Company Should Merchandise *and How*."

The Tuesday afternoon meeting will close with a series of informal addresses and discussions of the problems brought up in addresses.

WEDNESDAY PROGRAM

Wednesday's formal program will open at the Auditorium with a paper by P. McD. Biddison, Bastrop, La., on "Limiting Factors for Natural Gas Projects," and W. G. Hagan of Cleveland will follow him with a discussion on "Pipe Corrosion and Protection." J. D. Creveling of Henry L. Doherty and Company, New York, will act as chairman for a question discussion, the subject of which will be announced later. These discussions will occupy the entire afternoon session on Wednesday.

A technical program will fill the morning of Thursday, May 10, last day of the convention, with sessions in the Auditorium as usual. J. D. Best of Houston will talk on "Gas Sands in South Texas," and reports wlil be heard from the main technical and research committee, the gas measurement committee, and the pipe line flow committee.

Reports of committees on the chairman's address, on the place of meeting, on nominations, will be followed by the election of officers for the coming year and a report of the committee on final resolutions. Then the convention will adjourn for another year.

Special commendation goes deservedly to the committee on papers of which L. K. Langdon of Cincinnati, Ohio, is chairman, other members being J. H. Maxon of Muncie, Ind., and F. L. Chase of Dallas.

Another attraction that will draw perhaps as many people as the program itself, is the unusually complete and extensive exhibit of gas appliances and machinery to be shown during the entire convention in the Manufacturers' Building. There will be upwards of 200 exhibitors in this building, most of whom have had their space reserved for many weeks. All of the newest wrinkles in gas appliances and natural gas equipment will be shown in the Dallas exhibit.

So much for the business part of the program, which, delegates may rest assured, will make the convention technical contribution to the industry.

But Dallas believes in play as well as work, and the arrangements committee has long ben on the job making plans for entertaining the gas men when thy are not in convention.

COMPLIMENTARY LUNCHES

Every day at noon will be served a lunch, complimentary from Dallas, to the delegates. M. Harris, one of the most famous of Texas *maitres d'hotel*, will be in charge and has promised an old time Texas barbecue. Mr. Harris is fattening his young calves and lambs and will store them on ice in Fort Worth. Every day from 500 to 800 or more gas men will be served free of charge the best lunch that Southwestern ingenuity can provide.

Dallas is unusually well supplied with country club and golf facilities which are available most of the year because of the mild Texas climate and which will be in excellent shape at convention time.

Aside from the casual entertainment that will be provided, several definite events have been planned for the benefit of the gas men while they are in Dallas.

SMOKER IS BIG EVENT

Probably the high point of fun will be the smoker, a stag event, vaudeville and accompaniments, booked for the night of May 8, at the Adolphus Hotel junior ballroom. There will be three hours of unadulterated fun, every number carrying a punch and a laugh. The best music that can be found will be included in the smoker program.

James P. Bounds, formerly of the Palace Theater of Dallas, is the generalissimo who has arranged the evening's program, and he will crack the whip for the fun circus.

A part of the stage entertainment will consist of a knockout vaudeville performance consisting of all kinds of dances, a Hawaiian, a Palm Beach romp, Turkish, Oriental, and "Bolshevik" dances and a "drag-out number" which is closely connected with a prominent member of the gas fraternity.

When the fumes of this memorable smoker have died away, and the men are ready for another entertainment, the annual banquet on the evening of May 9 will be in order.

Two of the most prominent citizens of Dallas are arranging for this event, and it should be a classic These gentlemen are E. R. Brown, president of the Magnolia Petroleum Company, and L. B. Denning, president of the Lone Star Gas Company.

Karl F. Griffith, attorney for the Lone Star Gas Company, will preside as toastmaster, and banquet speakers include the following: H. O. Caster, Henry L. Doherty and Company, New York; L. K. Langdon, Cincinnati, chairman of the convention papers committee; and Oscar H. Fogg, A.G.A. president.

Joe Taylor, wittiest Texas columnist, who writes for the Dallas News, will furnish the impetus to after-dinner humor.

A TEMPTING MENU

The menu of the banquet includes Texas grapefruit (a delicacy, it will be agreed, stuffed with fresh strawberries, tomato rose chantilly cheese straws, roast boneless chicken en casserole with Parisienne potatoes and new asparagus draw butter sauce; tomato stuffed with apple, celery and mayonnaise, baked Alaska, macaroons, and demi-tasse. All of the vegetables and meat given the guests is Texas grown.

Wives of Dallas gas men are preparing entertainment for the visiting women. This covers a wide variety of events so that all of the visiting women will have their choice in the way of diversion.

Because of the outstanding accomplishments in natural gas production and expansion in Texas during the past few years, it is expected that many of the gas men will be interested in seeing at first hand some of the outstanding evidence of gas growth in the state. Trips may be arranged to view large gas installations in Dallas, especially the oil refineries. These establishments, which manufacture fuel, use natural gas for power because they find it cheaper and more reliable than their own oil products.

Personnel of Convention Committees

Convention Arrangements: Chairman, H. C. Morris, Dallas; F. M. Lege, Jr., Dallas, and Chas. B. McKinney, Houston.

Convention Papers: Chairman, L. K. Langdon, Cincinnati; J. H. Maxon, Muncie, and F. L. Chase, Dallas.

Convention Banquet: L. B. Denning, Dallas, and E. R. Brown, Dallas.

Convention Smoker: H. C. Morris, Dallas, and F. M. Lege, Jr., Dallas.

Exhibition Committee: Chairman, H. L. Montgomery, Bartlesville; C. C. Cartwright, Ft. Worth; H. N. Greis, Tulsa; A. W. Leonard, Tulsa; E. F. Schmidt, Dallas; H. L. Whitelaw, New York; C. W. Berghorn, Director of Exhibits, A. G. A. Headquarters, New York.

In Amarillo, in the Texas Panhandle, is the biggest gas field in the world. It is probable that trips will be arranged to this field for those especially interested in the production end.

REGISTRATION

The registration of delegates will take place at a large table just as the visitors enter the Manufacturers hall where the biggest exhibit will be held. In the center of the exhibit will be a lounge space with comfortable chairs and reading material where delegates may rest. Long distance telephone and telegraph wires will be run into the exhibit hall There will be complimentary noonday luncheons, tendered to every one wearing a badge, served immediately back of the exhibits and close at hand so that exhibitors can obtain their lunch by walking only a few feet.

Courtesy automobiles will run from the Adolphus Hotel to the Fair grounds and back, caryring delegates from their hotel headquarters to the auditorium and exhibit building.

N. C. McGowen, chairman of the Natural Gas Department, reports excellent progress in the filling of exhibit space. Last year in Cincinnati there were 104 exhibitors. This year there were that many by the end of March with more than a month to go. Since that time applications have been received steadily and it is expected that the 200-mark will be reached by the time the doors of the great exhibit building are ready to open. There are 210 booths available, amounting to 20,320 square feet, with possible total sales of space amounting to $16,730.

All arrangements have been made for the mechanical end of the exhibit. Badges like those of last year will be used, a registration desk will be ready, four girls to handle this work, another girl at the information window, a man to handle the sale of banquet tickets and to sign the railroad certificates for validation by the railroad representative.

At registration each delegate and exhibitor is given three luncheon tickets for the convention, complimentary from the city, a complimentary ticket to the vaudeville and smoker at the Adolphus Hotel for the evening of May 8, and an opportunity to buy his banquet ticket for the evening of May 9.

A registry card contains the name of the delegate, his company, and his hotel in Dallas so that he can easily be located if he is wanted.

A reception to the general public will be

staged on the afternoon of Wednesday, May 9. While the public is welcome at any of the meetings, the Wednesday afternoon entertainment will be especially arranged for them, at which time there will be music, demonstrations of the newest thing in kitchen arrangements, possibly refreshments by some of the exhibiting companies and there are rumors of an interesting contest to be staged.

It is evident to all of us that the Dallas convention will be one of the most valuable meetings we have ever had, and one that none of us can afford to miss. We have finished an outstanding year in the history of natural gas. We are entering another such year, and it is the hope of Dallas gas men and of all others that the convention here will be worthy of the gas industry throughout the United States.

GAS APPLIANCE DRIVE UNDER WAY IN NO. CALIFORNIA

As *Western Gas* goes to press the Gas Appliance Society of California is in the midst of it's annual Spring Campaign dates for which are April 29 to May 5 inclusive. The campaign this year is designated as the "1928 Gas Range and Water Heater Exhibit."

Ground work for the campaign has been well laid by the central committee, which is headed by F. U. Naylor, executive secretary and campaign director, also manager of gas sales for the Pacific Gas and Electric Company. Promotion meetings to stimulate co-operation in the campaign program were held in four communities during April, at Sacramento, April 23, San Francisco, April 24, San Jose, April 25, and Oakland, April 26.

PRECIPITATOR WILL BE INSTALLED AT PORTLAND

Contract has been signed by the Portland Gas & Coke Company for a precipitator for the removal of tarry matter from the smoke issuing from lampblack drying kilns.

The smoke, which is of relatively low temperature and does not rise and dissipate in the air, has been a vexing problem for several years. The precipitator chosen for the Portland plant is in use at many large smelting plants and has been shown by large scale tests to successfully remove the objectionable matter and reduce the smoke to a white mist which consists of the steam from the moisture removed in the kilns. This mist disappears a few feet from the stack.

Before signing the contract a large scale test was made to determine the size of the apparatus required.

JONESBORO TIME EXTENSION GRANTED FRANCHISE HOLDER

A 30-day extension of time has been granted the gas franchise holder in Jonesboro, Arkansas, so that the matter of serving natural gas or artificial gas can be settled upon Time for beginning the erection of the plant was extended one month from the 1st of April when it was considered possible that a line from Louisiana to St. Louis would go through Jonesboro.

In 1927 a total of 179 committees, with a personnel of 1575 members, were lined up in the American Gas Association's working organization.

Installation of large feeder mains to improve service conditions in the La Jolla, Point Loma and Old Town districts is the largest item in the San Diego Consolidated Gas and Electric Company's gas improvement program for 1928.

Calif. Natural Gas Problems

(Continued from Page 48)

ments; that is, to supply fuel for heating and cooking in the home. In addition to this essential service, gas is also used in practically every field of industry where fuel is required.

The major problem of the natural gas industry is to have available in its distribution system sufficient gas at all times to meet the requirements of all its consumers. To better discuss this problem, two charts have been prepared, showing typical load conditions.

SEASONAL DOMESTIC LOAD

Chart No. 1 shows the hourly load of the domestic consumption on an average summer day, and the same for an average winter day. As already pointed out, the supply of casinghead gas available to the gas utility is produced at a fairly uniform hourly rate throughout each day, and in order to meet the varying hourly requirements, (as set forth on these charts), for any day, it becomes necessary for the gas utility to provide storage, or holder capacity conveniently located to distribution centers, in which gas can be stored during the hours of minimum consumption, and withdrawn during the hours of maximum requirement. If it were possible to exactly balance supply and consumption by using storage holders, the rate of in-put into the transmission system of the gas utility would be uniform each hour, and would equal the average of the daily requirement as indicated by the average line on the chart. Since this is not always possible by reason of hourly load fluctuations which cannot be anticipated, it often becomes necessary to modify the hourly rate of in-put into the transmission lines. The transmission lines can be used, and are used to a limited extent, as storage capacity, but the primary use of the transmission system is for the transmission of gas, and not for the storing of gas.

SEASONAL LOAD VARIATIONS

Chart No. 2 shows the average monthly domestic load and the average monthly industrial load for a year, and indicates the seasonal variation in the total load.

As already pointed out, the domestic business is the essential business of the gas utility, and this requirement must necessarily have preference over the industrial load

Therefore, the ideal situation for the gas utility would be one in which an unlimited industrial load is available, which could be turned on or off at will, so that at times of maximum demand of the domestic consumers, the industrial load could be curtailed to the extent necessary, and at times of minimum demand of the domestic consumers, the industrial load could be correspondingly increased. In actual practice, however, conditions are very far from ideal, and we find that the industrial consumer objects to being shut off, since this means that he must use other fuels, and must necessarily maintain duplicate burner equipment. Furthermore, interruption in natural gas service interferes in many instances with the consumer's plant operations.

The supply of natural gas available to the gas utility and the requirements of the preferred consumers regulates the gas supply available for industries. Ts there can be no assurance that the total industrial requirements will always be satisfied, it becomes necessary to offer the industrial consumer, subject to shut off, a rate sufficiently attractive to offset the objectionable features of this class of service. The ability of the natural gas utility to meet this condition depends upon economic conditions.

The variation in seasonal demand cannot be taken care of by storage or holder capacity, and the only solution is to regulate the in-put into the transmission system to balance the seasonal demand, and it is for this reason that the gas utility in California usually finds it necessary to curtail the amount taken in the various fields during the summer months.

FUTURE OF PRODUCTION

The gas utility must continue to serve gas to its consumers year after year, and is vitally concerned with the future of natural gas production. To acquire knowledge as to future trends it must collect, compile and study natural gas production statistics. Where natural gas production comes from gas wells the problem is not so difficult because dry gas reserve can be approximated, computed, and checked from time to time, but where the gas utility depends on casinghead gas for its supply the problem is difficult by reason of the many uncertain and variable factors involved. For example, the oil company may change its method of operating oil wells, thereby changing the rate of gas production, and further, the oil company, having prior call on gas it produces, may find added uses for its gas in its business. This results in a smaller amount available to the gas utility. The latter tendency is much in evidence today and it is only by the closest co-operation between the oil and gasoline companies and the gas utilities that the natural gas industry can secure the needed production information to guide it in its future development. This co-operation is also necessary to enable the natural gas industry to render the best service to the producer in securing for him the greatest possible market for natural gas, and also to render the best service to the consumer.

GAS HEAT STANDARD FOR VANCOUVER CHURCHES

The heating department of the gas section of the British Columbia Electric Railway Company at Vancouver, B. C., completed the installation of a vacuum gas heating system in the new Ryerson United Church, 45th avenue west and Yew street, Point Grey, B. C., recently. This type of heating has become standard for church buildings in Greater Vancouver.

In addition to this installation, the heating department also installed a complete gas heating system in the Fairmont Athletic Club. Nine vacuum radiators were used in this building.

ARKANSAS NATURAL GAS CO. ORGANIZATION COMPLETE

The Arkansas Natural Gas Company of Delaware has been organized as the parent company of the Southern Cities Distributing Company which is composed of gas producing, transporting and marketing properties of the Cities Service Company subsidiaries in Arkansas, the Arkansas Natural Gas and Arkansas Fuel Company in Arkansas and North Louisana, and the Middle-West Utilities Company in Louisana, Arkansas and East Texas.

Natural Gas *in* Louisiana

(Continued from Page 41)

The increasing importance of sources of cheap fuel attracted outside interests into the state. Among these may be mentioned the Palmer interests of Chicago, who not only helped to develop the gas, but further sought out industries to locate in the state and assist in the development of its resources.

It was in 1916 that the first gas well was drilled in the Monroe gas field. Since then the field has been extended over an area of approximately 350 square miles. As the immense gas measures were discovered the carbon black industry found it profitable to enter. Eighty per cent of the carbon black manufactured in the United States comes from the Monroe field at present.

CARBON BLACK

The following excerpts are taken from the Bureau of Mines report made by G. R Hopkins on "Some Economic Phases of the Carbon Black Industry":

"Carbon black is a fluffy, velvety black pigment, made by burning natural gas with insufficient air. Although it has been in use for about fifty years, it would still be comparatively unknown to all except ink manufacturers, had it not been for the discovery of its use in rubber in 1915. The carbon black industry owes its early existence to the printing press, but its recent growth and present economic status is due to the rubber industry, which, in turn, is dependent on the automobile."

STATUS OF CARBON BLACK PLANTS IN MONROE GAS FIELDS

AS OF MARCH 1, 1928

Total Units Built in Field		*Total Houses Built in Field*	*Total Units In Operation*	
105		2804		74½
Total Houses In Operation	*Total Idle Units*	*Total Idle Houses*	*Total Units Moved*	*Total Houses Moved*
2103	15½	353	15	348

Authority: Minerals Division, Department of Conservation, State of Louisiana.

Quoting from a report recently made by Wm. F. Chisholm, Director of the Minerals Division, Department of Conservation, State of Louisiana, it is noted that:

"Louisiana is lowest of the twenty-four producing states in regard to average value of natural gas at the wells and at points of consumption. This condition is partly due to the fact that a great volume of cheap gas is sold to the carbon black plants and consumed close to the point of production without heavy transportation and distribution charges. With the development now taking place in Louisiana's domestic and industrial market, both in the State and beyond its border, this low average price at the well and at points of consumption will show a decided rise."

DISCOVERY OF FURTHER GAS FIELDS

The Spring Hill-Sarepta gas area in Webster Parish was discovered in the course of oil drilling in 1920. The discovery of the Haynesville oil field followed closely thereafter, and gas from the above field was used for the drilling and subsequent oil pumping operations.

In 1924 Cotton Valley was developed, at first as a potentially large gas field. Later some oil was found—sufficient to ruin a gas field for the time being.

In 1925 Waskom and Pine Island gas areas were found, which have further increased the already huge gas reserves of the State.

During this time the Southwestern Gas & Electric Company, the distributing company in the city of Shreveport, had reached out in many directions to augment its system, and had furnished the cities of Texarkana with gas, together with other communities along the way.

Another system, the Oil Fields Company, later merged into the Northwest Louisiana Gas Company, had been furnishing gas to the various oil fields in the northwestern part of the state—Haynesville, Homer, Bellevue, Cotton Valley, and to the towns of Haynesville, Homer, Spring Hill and Minden.

A further development in the Monroe area had been the piping of gas into the city of Monroe and surrounding towns.

The Southern Carbon Company in 1923 had laid a line from the Monroe field to the city of Alexandria, serving them at the city gate.

In the southern part of the State a gas field had been discovered in 1918 in Terrebonne Parish, which served the town of Houma as well as the surrounding communities.

The town of Mansfield had likewise been furnished with gas from a nearby field; a line had also been laid to serve the town of Natchitoches, Marshall and several East Texas towns were also supplied with natural gas from Caddo fields. These lines were of small dimension.

MAJOR DEVELOPMENTS

At this point in 1925, began in earnest the pipeline development of Louisiana natural gas.

The Magnolia Gas Company, subsidiary of the Magnolia Petroleum Corporation, projected a telescope 14-16-18 inch all-welded line from the Waskom and Spring Hill-Sarepta fields, a distance of 217 miles, to serve the Magnolia refinery at Beaumont, Texas, on the Gulf coast.

In 1927 the Latex Gas Company, a subsidiary of the Magnolia Gas Company, projected a further line of 14-16-18 inch pipe from the gas fields of Waskom, Spring Hill-Sarepta, Pine Island and Cotton Valley, a distance of 210 miles approximately, to serve part of the industrial load in Dallas and Fort Worth as well as serving several East Texas towns along the way.

The Interstate Natural Gas Company system was promoted under Ford, Bacon & Davis management, from the Monroe field to the Standard Oil Company's refinery at Baton Rouge, La., the line consisting of some 230 miles of 22-inch pipe.

The Advance Bag and Paper Company constructed a six-inch welded line from the Monroe field, a distance of 44 miles, to their new paper mill at Hodge, La.

The Natural Gas and Fuel Company leased the Crusader Oil Company's 10-inch line to push gas from the Monroe field into the El Dorado, Arkansas, area.

The Ouachita Natural Gas Company completed a 16-inch line from the Sterlington district in the Monroe field to El Dorado, Arkansas, to furnish the City of El Dorado.

Moody-Seagraves interests put through the Dixie-Gulf Gas system, furnishing gas to a number of East Texas towns and to the gulf coast cities of Beaumont, Port Arthur and Houston. The line extends from the Waskom, Cotton Valley, Spring Hill-Sarepta, Carterville, Elm Grove and Bethany gas areas, a distance of some 278 miles, mostly of 22-inch line.

Early in 1928 the Interstate Natural Gas Company line was completed from Baton Rouge to a point near the city of New Orleans at Destrehan.

In the period during which natural gas has been supplied from Louisiana fields to Little Rock, Dallas, Fort Worth, Houston and Beaumont, the mecca city of the State, New Orleans, has had artificial gas only. During these years much agitation has been raised to get natural gas into that city, but through a lack of teamwork and friendly co-operation, the situation has become such that a great city has seen fit to send broadcast over the country an appeal for some bold men with heavy finances to come into the picture. Things have been done this way, but not often. If New Orleans really desires natural gas, and gets down to cold calculating as well as an understanding of the problems involved, it can get it.

1928 PROGRAM

What the present year of 1928 will add to this evolution of pipeline projects remains to be seen. In these brief few months there have been changes of striking import.

Through consolidation with the Arkansas Natural Gas system, extending north into Little Rock, Arkansas, and with the Southwestern Gas properties of Shreveport and Texarkana, formerly owned by the Dawes interests and then by the Insull group, and the Natural Gas and Fuel system extending from the Monroe field into southern Arkansas, the Henry L. Doherty, Cities Service group have laid the fundations of a further enlargement of their wide flung natural gas system, reaching from the Texas Panhandle to the plains of Kansas and Oklahoma, and into Missouri. Such an organization will unquestionably stabilize the growth and future expansion of the territory it serves.

A further combination affecting the Louisiana picture is the merging of the Moody-Seagraves interests into one organization, including in it the Houston Gas & Fuel Company, Houston-Gulf Gas Company, Southern Gas Company of Texas, and the Dixie-Gulf Gas Company, a consolidation of the State Line Gas Company, a part interest in the Reserve Gas Company, and the Dixie Gas & Utilities.

The discovery of the Richland Parish gas field and its large probable reserves has inaugurated plans for the construction of a 24-inch pipeline into Memphis and possibly St. Louis.

The Moody-Seagraves interests have large holdings in the Monroe and Richland areas. The new Cities Service combine also has, as well as the Palmer Corporation and the Southern Carbon Company and the Natural Gas Products Company and Gas By-Products Company, subsidiary of the Electric Bond & Share Company. This latter corporation together with H. C. Couch, head of the extensive Louiisiana-Arkansas Power developments of Electric Bond & Share Company, is planning a 60-mile pipeline of 12-14-16 inch from the Monroe field to Camden, Arkansas, and eventually to Pine Bluff. It is significant to note that the Electric Bond & Share interests control through various subsidiaries the Memphis Power & Light as well as the New Orleans Public Service Corporation.

A line has been proposed from the Monroe area into Mississippi and as far osutheast as Mobile, Alabama. Nothing definite has been done on this project so far.

As a further solidification of the Magnolia Gas system, a line is expected shortly to be built from the Monroe field to tie into the system at a point in northwest Louisiana.

Belchic and Laskey, Inc., who have devel-

oped the Northwest Louisiana Gas Company, and Peoples Gas & Fuel Company, are planning a system down into South Central Louisiana from the Richland Parish gas field. This system will give to the people of the state of Louisiana some of the gas of Louisiana The project calls for 8-12-16 inch pipelines and will include some 60 cities and towns, as well as serve the sugar cane and rice, salt mining and sulphur mining country. It is expected that this line will be completed by fall of 1928. As progress has been irresistible in other sections, so will the bringing in of natural gas stimulate and hasten the growth of the State whose resources are so immense.

What the future of this vast expansion will bring is of course indeterminable. However, this much can be said: The construction of several hundred million dollars of natural gas pipeline systems in a region foretells an era of enlarged scope and activity. The future discovery and development of further gas areas will continue to furnish the sinews of industry for many years to come. As a still more distant prospect the vast deposits of lignite in the region will serve as the source of gas supply when the last natural gas reserves are being drawn down to the ultimate limits.

That is the picture of the Southwest in the rushing tide of present day evolution. The country is changing—the old timber and sawmill days of Louisiana are going. Paper mills, with a cycle of replanting to care for indefinite future requirements; chemical and electro-chemical industries, as well as other basic industries taking advantage of the supplies of raw materials—iron ore, sulphur, potash—with water and rail transportation, are in the making.

Twenty Years *of* Growth *on* Lone Star System

(Continued from Page 45)

Also during 1920 lines were constructed from Joshua to Waco and to Corsicana. Since that time, and particularly within the last five years, lines have been completed to Temple and Belton and to Bryan and College Station on the south, Sulphur Springs and Paris on the east, Purcell, Oklahoma, on the north, and Colorado, Texas, on the west. One of the largest single pipe line construction jobs recently completed was the 18-inch line from Wichita Falls to Wheeler County, Texas, making available the millions of cubic feet of gas developed in that territory, as well as rendering service to a number of cities and towns along that line.

By referring to the map of the Lone Star Gas Company system, which is reproduced herewith, it will be seen that from its humble beginning, the company has, by construction and by acquisition of other smaller properties, developed a system comprising over 3,200 miles of pipe lines on which are located 20 compressor stations, ranging in size from two to 24 units having a total combined capacity of 33,000 horse-power, and drawing its supplies from 21 fields throughout North and West Texas and Southern Oklahoma, with a total open flow capacity well above one billion cubic feet per day.

Again I say, The Lone Star Gas Company is proud of the part it has taken in assisting the development of the Southwest. It has been quite an undertaking to provide facilities to meet the urgent demands for extensions to serve new cities and towns throughout the territory, as well as to meet the constantly growing needs of those already connected to its system, but, it has been a job well done.

Importance *of* Industrial Load *to* Pipelines

(Continued from Page 49)

49 million cu. ft. is then sold as non-preferred industrial gas with the shut-off clause in the contract. Of course, we do not expect to have 100 per cent load factor on our system, but we do expect to increase it to give us a relative level load curve and allow our operations to continue steadily throughout all seasons of the year.

In the process of securing preferred industrial gas business, we confine our efforts to that class of industry that can and will pay more for natural gas than the actual off-setting fuel cost. This clss of industry includes those manufacturers who have process heating loads, such as metal pots, annealing furnaces, forge furnaces, core ovens, bake ovens, small boilers and plants so located that it is difficult to get other fuels into their plants. Of course, such advantages as flexibility of control, even temperatures, elimination of handling expense and cleanliness are factors in favor of natural gas in preferred industrials as well as other classes. Preferred customers should and do insist on year around service.

LARGE INDUSTRIALS

We then come to the large industrial plant and in this area there are many oil refineries, cement plants, brick plants, electric plants, ice plants, packing plants and others requiring enormous amounts of fuel each year. It is with this class of industries we are endeavoring to build up our off peak business. We realize in order to get this business we must actually show a saving over coal, oil or whatever fuel the prospect is now using. In fact, it is necessary in most cases to show a saving that will not only offset the price of present fuel on a straight heat content basis, but it must enable them to justify the expenditure necessary to change their plant to gas, to install stand-by fuel and other items that may enter into the picture of changing to gas. This necessitates getting our gas price down rather low for such a desirable fuel, but we justify this reduction by keeping our pipe lines and compressor stations under constant operation, thereby building up a load factor which will allow the pipe line company to take a uniform quantity of gas from the producers throughout the year.

Acting on the decision of our company to connect the Texas fields with our general main line system at Wichita, an organized effort was started by the industrial departments of both main line and distributing companies to connect industrial gas.

Our efforts to date have been confined chiefly to the large industries, or non-preferred class, and our preliminary estimates of potential markets have been borne out in every respect, as we now have under contract several plants of practically every class of industry in the Southwest.. Natural gas has now taken its place beside coal and oil as a major boiler fuel in the manufacturing plants in this territory.

RIGHT OF WAY FOR KNORPP LINE REPORTED PURCHASED

A 30-mile right of way section, varying from 16 to 20 feet wide has been purchased near Woodward, Oklahoma, by the John L. Knorpp interests, according to an announcement. A surveying crew is reported to have covered a distance of 100 miles between Alva, Oklahoma, and the Oklahoma and Texas line surveying for the Panhandle-to-Kansas City line projected by Knorpp interests.

GAS RANGE MERCHANDISING REPORT NOW COMPLETE

A special joint committee on the merchandising of gas ranges has been at work in northern California for some time and the Gas Appliance Society of California during April announced that the committee's report is now available, covering the following subjects:

1. Concerted Action by Gas Range Manufacturers in Bringing out Their New Models at One Time only during the Year.

2. Time for Concerted Advertising of A.G.A. or Blue Star Standards.

3. Suggested Re-Sale Prices on "Close-Outs."

4. Agreement by Retailers not to Advertise Ranges at Prices Lower than a Certain Specified Minimum Consistent with Good Quality and Service.

5. Uniformity by Manufacturers in Allotting "Close-Outs" only to Their Own Dealers on an Equitable Basis.

6. Agreement by Dealers to Advertise "Close-Outs" or Discontinue Models as Such.

7. Standardization of Colors on Ranges, Limiting Colors to not More than Three.

The purpose behind this report is to stabilize the gas range market and reduce the tendency of destructive merchandising of "close-outs" in the territory represented by the committee members.

ANNUAL REPORT OF ALBERTA NATURAL GAS OPERATOR

THE annual report of the Western Natural Light, Heat & Power Company of Calgary, Alberta, shows that the gross sales of gas in 1927 amounted to $1,565,022. The company paid $76,475 in dividends on its six per cent preference shares, and $420,000 on its $8,000,000 worth of common stock.

To the gross amount mentioned in connection with the gas sales is added income from other sources, making a total of $1,661,433. This latter item includes $52,513 from the Imperial Oil Company for the transportation of gas through the company's lines.

General administration expenses total $267,271, with an additional $179,897 for miscellaneous general expenses. The balance of profit carried forward amounts to $546,826.

Of the total revenue of the company domestic consumers contributed $1,222,271 for the purchase of 3,156,754,000 cubic feet of gas. Commercial consumers took 536,519,000 cubic feet for $167,375. Other revenue amounted to $96,410, making a total of $1,661,433. The average price obtained for gas in 1927 for each 1,000 cubic feet of gas was 33.52 cents.

Directors state that the present open daily flow from the various gas fields is as follows: Turner Valley, 25,000,000 cubic feet; Foremost, 63,113,000 cubic feet; Burdett, 15,625,000 cubic feet; Chin Coulee, 385,000 cubic feet.

The company now proposes to tap a natural gas reservoir some 44 miles west of Calgary drilling to begin soon.

MAY EXTEND COAST COUNTIES LINES TO WALNUT CREEK

Walnut Creek, California, is asking for gas, and the Coast Counties Gas & Electric Company has given assurance that its lines will be extended if 300 consumers can be secured. Petitions for gas signers have been placed in circulation and on May 8th the city's Chamber of Commerce will reply to the company's offer. Line extensions of 72,000 feet, from Pacheco, at a cost of approximately $40,000 would be necessary.

California Gasoline Company's Plant No. 5

(Continued from Page 55)

two more units, each with its own absorber, still, pumps, boilers, cooling tower, etc. With these added units the plant wll have a capacty of 50,000,000 cubic feet per day and 120,000 gallons of gasoline.

In California, natural gas has become a rather valuable commodity and promises to become more so in the future. Consequently much thought was given to fuel economy and dry gas, or residue distribution. The most modern fractionating and pumping equipment was installed. Every foot of gas, steam, vapors, oil, etc., is recorded daily and kept to a minimum. The calorific value of the gas is recorded periodically for use in calculating efficiencies of boilers and engines.

The dry gas is distributed, through a rather elaborate metering manifold, to the field, the various gas company sales, dry gas booster compressors for high pressure sales, the company's refinery at Watson, dry gas blown to the air, and the various fuel consumption points within the plant and system. A wet gas master meter is maintained, measuring all the wet gas into the plant. This is a check against all the wet gas meters in the field, and the discrepancy between this meter and the field meters is maintained at a minimum. In like manner all the dry gas returned to the producers in the field is metered at each individual service and must check closely the master dry gas meter at the plants. The total field unaccounted-for gas is reported each day in the same manner as the individual plants. This unaccounted-for gas is running about four per cent of the total received.

The boiler plant is a departure from the oil field practice of fire box, or return tubular boilers, to the water tube type boilers. Careful consideration was given in selecting the boiler plant equipment as to flexibility, capacity, efficiency, etc., it being designed to carry a normal load of 140 per cent of rating with a maximum of 200 per cent.

Two 250 and two 157 H. P. water tube boilers of the curved tube type were installed, designed for 200 pounds working pressure, and about 20 degrees super-heat, with six-foot settings and insulated walls, having a furnace volume of 2.23 cubic feet per boiler horse power at rating. Ninety-two stacks provide a draft of 6 inch.

Low pressure gas burners are used and operate at about four-ounce pressure at rating, to twelve ounces at 200 per cent. Dampers and differential draft gauges are used on each boiler for checking and keeping combustion at highest point of efficiency. Electrical pyrometers are provided to record the temperature in each pass of the boiler, also steam and feed water temperature. Orifice type meters are used on steam and fuel, and in addition a water meter for checking the amount of water consumed in blowdowns. The boilers are blown every two hours to keep the concentration in the boiler down to a minimum. Boilers are cleaned and inspected regularly every 1100 hours of service. Automatic feed water level controls are installed on each boiler, also gauge glass illuminators at water level. Steam headers are Vanstone joint, long radius bends to allow for free expansion and automatic non-return valves at the boilers.

Three-way cocks are installed on gas lines to burners and are closed to the burners when boiler is out of service, to prevent leakage of gas into the furnace and prevent a possible explosion, should the regulating valve leak.

Feed water equipment consists of two open feed water heaters, 600 H. P. each, one three-stage centrifugal pump Turbine driven non-condensing, 160 G. P. M., 500 foot head with two reciprocating pumps for stand-by. Exhaust steam is supplied to the heaters from the feed water pump Turbine, and from the pumps in the absorption plant. Approximately 60 per cent of all the exhaust steam and water from the steam traps is returned to the heaters and 40 per cent make up is supplied by a Zeolite water softener. A constant temperature of 214 degrees Fahrenheit is maintained Grease extractors are used to extract the steam cylinder oil from the exhaust steam before the water enters the boiler. An increase in feed water temperature, from 140 degrees to 214 degrees Fahrenheit, made a saving in fuel of about nine per cent, or 103,000 cubic feet of gas per day.

Boilers are operating at present at 175 per cent of rating, making an over all efficiency of 80 per cent plus.

SO. CITIES DISTRIBUTING CO. LOCATES AT SHREVEPORT

The Southern Cities Distributing Company, subsidiary to the Cities Service Company and organized when the gas properties of the Southwestern Gas & Electric Company were merged with the holdings of the Arkansas Natural Gas Company, has chosen Shreveport for its headquarters. The merged properties serve gas to more than 74,000 customers.

In the merger the Cities Service Company acquired oil producing properties in Louisiana, Arkansas and Texas and 30,000 acres of undrilled oil and gas land. The property also includes six gas compressor stations of 16,000 horsepower and three gasoline extraction plants.

The gas properties acquired serve gas to Shreveport, Texarkana, Pine Bluff, Hot Springs, Hope, Arkadelphia, Little Rock, Long View, Magnolia and Malvern together with a number of other towns in Arkansas, Louisiana and Texas.

NATURAL GAS FOR EL PASO

The City council of El Paso, Texas, has employed Louis C. Hill of Quinton, Code & Hill, Los Angeles consulting engineers, to make a survey of the community's natural gas situation Applications for franchises to serve the city with natural gas are understood to be in hand from the El Paso Gas Company, and also from C. A. McKanna and associates of San Francisco and Albert Woods and Judge C. T Quinn of San Antonio. The engineering report from Mr. Hill will cover the gas fields of Winkler, Artesia, Amarillo and others.

Bivens, Bridge *and* Thompson Receive Promotion *to* Southern Counties Vice-Presidencies

FRANKLIN S. WADE, recently elected president and general manager of the Southern Counties Gas Company, Los Angeles, on April 18 announced the election of his associate executives, F. H. Bivens, A. F. Bridge, and M. R. Thompson to the positions of vice-presidents of the company.

F. H. Bivens was made vice-president in charge of public relations and sales, A. F. Bridge, vice-president in charge of operation, and M. R. Thompson, vice-president in charge of construction.

Mr. Bivens' entire business career has been spent in the service of the gas industry. He has been active in the Southern Counties organization since its inception in 1911, and during the past 17 years has at various times been district manager of nearly all the districts which the company serves. The past three years he has been in the general office of the company in the position of general agent.

A. F. Bridge became associated with the Southern Counties Gas Company at the conclusion of the World War in 1919. From 1913 to 1917 he was an assistant engineer of the California State Railroad Commission in charge of its supervision of gas property in the state. At the beginning of the World War in 1917, he was commissioned a Captain in the Engineering Corps, and served overseas and at the conclusion of the war, served as an appraisal engineer in Belgium under the Reparation Commission.

M. R. Thompson has been chief engineer of the Southern Counties for many years, beginning his public utility career with the company at the time of its organization in 1911, having been in charge of all construction throughout the development of the utility.

Messrs. Bridge and Thompson are recognized as the engineers who have developed and put into practical operation the high pressure type of gas storage holders now extensively used in Southern California.

INDUSTRIAL LINE BEING LAID IN KANSAS CITY

Kansas City Gas Company is extending its line from the Sheffield Steel Company to the Standard Oil Company of Indiana refineries at Sugar Creek, Mo. The line will be 21,000 feet in length, and is completed by June 1.

GASOLINE PLANT FIRE

A fire, caused by a defective weld in the base of a light gasoline treating tower, caused approximately $6,000 in damage to the Tiffin gasoline plant of the Lone Star Gas Company on April 12th. The plant is located seven miles northeast of Ranger and was purchased on March 20 from the Southern Gasoline Company.

KANSAS OPERATOR SEEKS NEWTON GAS PERMIT

The Rice County Gas, Electric and Power Company is seeking a gas franchise in Newton, Kansas, according to press reports. This company is now distributing gas in Sterling, Nidkerson and Lyons and wants to enter Newton as well as Hutchinson, with its system.

LONE STAR HEAD MOVES TO DALLAS

L. B. Denning, president of the Lone Star Gas Company has recently moved to Dallas, Texas, from Pittsburgh, Pa.

METER COURSE BULLETIN NOW AVAILABLE

Bulletin 95, of the Iowa State College of Agriculture and Mechanic Arts, is a 102-page publication condensing the papers and lectures presented at the Seventh Gas Meter Short Course, held December 6-9, 1927, at Ames, Iowa.

CONSOLIDATION OF MOODY-SEAGRAVES PROPERTIES

The Moody-Seagraves interests have consolidated their gas producing and distributing companies into one organization for the purpose of cutting down operating costs. This unites into one system gas producing interests in North Louisana, and Texas and lines to Houston from the West Texas field and the Dixie Gulf line from Waskom to Houston.

SOUTHERN COUNTIES BUDGET

Southern Counties Gas Company, Los Angeles, has announced a 1928 budget totaling $2,562,997 for improvements, to go largely towards construction of gas holders, mains, office buildings and other betterments throughout the company's southern California system. A 500,000 cu. ft. high pressure gas holder will be built at Santa Barbara, as one item in the program.

COLORADO SPRINGS ELECTION

A special municipal election has been set for June 5 in Colorado Springs, Colo., at which the natural gas franchise of the Public Service Company of Colorado will be submitted to voters. The company is requesting a 20-year franchise, and offers $600,000 for the municipal gas plant.

REFRIGERATION DRIVE

Southern Counties Gas Company is launching a sales campaign on gas refrigeration the first of May, the campaign lasting five weeks.

MORRILTON APPLICANT

S. R. Morgan & Company of Little Rock, Ark., is seeking a gas franchise in Morrilton, Ark., the gas to be brought from the Clarksville field.

POULTRYMEN IN PORTLAND FAVOR GAS

More and more of the poultry men in Portland, Oregon, are turning to gas for fuel. One poultry raiser has just installed gas burners in his 24 incubators, as well as in his brooders. Another has installed a gas-fired hot water system in his brooder house. He specializes in fancy friers and must have perfect control over temperature to get a forced growth. Yet another, who recently installed a 47,000 egg incubator, uses gas for fuel and is getting wonderful results.

ASSOCIATED SUPPLY COMPANY BOUGHT BY REPUBLIC SUPPLY

The Republic Supply Company of Caliornia recently purchased the Associated Supply Company, the purchase involving the entire capital stock of the Associated Supply Company which was acquired from the Youngstown Sheet and Tube Company for a reported consideration of approximately $2,000,000. The latter company purchased the Associated Supply Company from the Associated Oil Company only a few months ago. According to J. A. Crawford, president of The Republic Supply Company, his company, by reason of their purchase, becomes exclusive distributor in California for Youngstown Oil Country Tubular Goods.

Natural-Gas Gasoline Plants *on the* Pacific Coast

Compiled by E. T. KNUDSEN,
Department of Commerce, Bureau of Mines
506 Custom House, San Francisco, Calif.

COMPANY	ADDRESS	NO. OF PLANTS
American Natural Gasoline Corp.	911 C. C. Chapman Bldg., Los Angeles	2
Balell Gasoline Co.	Higgins Bldg., Los Angeles	1
Bankline Oil Co.	1018 Board of Trade Bldg., Los Angeles	1
Belridge Oil Co.	1106 Bank of Italy Bldg., Los Angeles	3
Brea Canyon Oil Co.	831 Standard Oil Bldg., Los Angeles	1
California Gasoline Co.	Security Bldg., Los Angeles	11
Calumet Oil Co.	517 I. W. Hellman Bldg., Los Angeles	1
Cienaga Corporation	714 Higgins Bldg., Los Angeles	1
Cowan Oil & Refining Co.	Merchants National Bank Bldg.,Los Angeles	1
Export Refining Co.	1022 Board of Trade Bldg., Los Angeles	1
O. C. Fields Gasoline Corporation	609 Board of Trade Bldg., Los Angeles	2
Fullerton Oil Co.	1124 Merchants National Bank Bldg., Los Angeles	1
General Petroleum Corp. of Calif.	Higgins Bldg., Los Angeles	9
Gralan Oil Co.	Box 3237, Taft, California	1
Highway Gasoline Co.	410 Roosevelt Bldg., Los Angeles	1
Holly Oil Co.	Bin "B", Huntington Beach	1
Honolulu Consolidated Oil Co.	215 Market St., San Francisco	1
Lomita Gasoline Co.	Box 669, Long Beach	1
Lovell Gasoline Corporation	Higgins Bldg., Los Angeles	6
Montebello Oil Co.	Security Bldg., Los Angeles	1
North American Oil Consolidated	351 California St., San Francisco	1
Norwalk Company	1018 Board of Trade Bldg., Los Angeles	1
Olinda Gasoline Co.	312 Union League Bldg., Los Angeles	1
Pan American Petroleum Co.	Petroleum Securities Bldg., Los Angeles	3
Petroleum Securities Co.	Petroleum Securities Bldg., Los Angeles	3
Rancho La Brea Oil Co.	1105 California Bank Bldg., Los Angeles	1
Reservoir Hill Gasoline Co.	714 So. Hill St., Los Angeles	1
Rice Ranch Oil Co.	548 So. Spring St., Los Angeles	1
Rio Grande Oil Co.	714 So. Hill St., Los Angeles	1
Ryan & Hackett	Pacific Mutual Bldg., Los Angeles	2
Shell Company of California	200 Bush St., San Francisco	7
Signal Gasoline Co., Inc.	505 Roosevelt Bldg., Los Angeles	1
Signal Gasoline Corporation	505 Roosevelt Bldg., Los Angeles	2
Signal Hill Gasoline Co.	A. G. Bartlett Bldg., Los Angeles	8
Southwestern Engineering Corp.	1221 Hollingsworth Bldg., Los Angeles	2
Standard Gasoline Co.	225 Bush St., San Francisco	47
State Gasoline Corporation	900 Spring Arcade Bldg., Los Angeles	1
St. Helens Petroleum Co., Ltd.	S. Broadway Bldg., Los Angeles	3
St. Helens Riverside Properties	S. Broadway Bldg., Los Angeles	1
The Petroleum Co.	Sun Bldg., Los Angeles	1
Torrance Gasoline & Refining Co.	312 Union League Bldg., Los Angeles	1
Union Oil Company of California	Union Oil Bldg., Los Angeles	10
United States Refining Co.	1022 Board of Trade Bldg., Los Angeles	1
Universal Consolidated Oil Co.	411 Crocker Bldg., San Francisco	1
West Coast Refining Co.	620 Pacific Finance Bldg., Los Angeles	3
Wilshire Oil Co.	2455 E. 27th St., Los Angeles	3

EXPLANATION OF SYMBOLS

Op	*Operating*
S. D.	*Shut Down*
Bldg.	*Building*
Abs.	*Oil Absorption Plant*
Bstr.	*Booster Plant*
Char.	*Charcoal Absorption Plant*
Comb.	*Combination Compressor and Oil Absorption Plant*
Comp.	*Compressor Plant*
O & C Abs.	*Combination Oil and Charcoal Absorption Plant*

LOCATION	COMPANY	DAILY CAPACITY (M.C.F.)	TYPE OF PLANT	STATUS
	Belridge—Lost Hills Field			
Belridge Lease	Belridge Oil Company	5,000	Abs.	Op.
Belridge Lease	Belridge Oil Company	5,000	Abs.	Op.
Cahn	Standard Gasoline Company	750	Comb.	S.D.
Fee Property	Universal Consolidated Oil Co.	2,000	Abs.	Op.
	Coalinga Field			
Sec. 27	Shell Company of California	4,000	Abs.	Op.
	Coyote Hills Field			
Brea Canon	Brea Canon Oil Company	5,000	Comb.	Op.
Brea Canon	Fullerton Oil Company	4,000	Comb.	Op.
Tonner	General Petroleum Corp. of Calif.	5,000	Abs.	S.D.
C. C. M. O.	Olinda Gasoline Company	2,000	Comp.	Op.
Puente Lease	Shell Company of California	24,000	Abs.	Op.
Brea Canon	Standard Gasoline Company	1,482	Comb.	Op.
Murphy-Coyote	Standard Gasoline Company	10,870	Comb.	Op.
Johnson Lease	St. Helens Petroleum Co., Ltd.	2,500	Abs.	Op.
Gilman Lease	The Petroleum Company	300	Abs.	S.D.
Stearns No. 1	Union Oil of California	250	Abs.	S.D.
Stearns No. 2	Union Oil of California	2,000	Abs.	S.D.
Stearns No. 3	Union Oil of California	10,000	Abs.	Op.
Chicksan Basten	West Coast Refining Company	10,000	Abs.	Op.
	Dominguez Field			
Callender Lease	American Natural Gasoline Corp.	8,000	Abs.	S.D.
Reyes	Shell Company of California	15,000	Abs.	Op.
Dominguez Estate	Standard Gasoline Company	4,285	Comb.	Op.
Hellman Lease	Union Oil Company of California	30,000	Abs.	Op.
	United States Refining Company	25,000	Abs.	Op.

SUPERBO
AUTOMATIC
STORAGE
WATER HEATERS

Manufactured in Los Angeles
Since 1914

— — —

Superbo "Safety"

A Quality Product

FEATURING: — Dual Safety Control — Detachable Heating Unit—Safety Gas Shut-off.

No. 1—22 gallons...$ 97.50
No. 2—30 gallons... 125.00
No. 3—40 gallons... 150.00
No. 4—66 gallons... 250.00

— — —

Prices F. O. B. Factory

— — —

Manufactured by

Superbo Mfg. Co.

Los Angeles California

LOCATION	COMPANY	DAILY CAPACITY (M.C.F.)	TYPE OF PLANT	STATUS
Elk Hills Field				
Sec. 34-S	Belridge Oil Company	7,000	Abs.	Op.
Sec. 3-31-24	Pan American Petroleum Company	6,000	Comb.	Op.
Sec. 35-S	Standard Gasoline Company	5,000	Comb.	Op.
Huntington Beach Field				
Savage	California Gasoline Company	3,000	Abs.	Op.
Holly Dev. Lease	O. C. Fields Gasoline Corp.	6,000	Abs.	Op.
Holly Lease	Holly Oil Company	4,000	Comb.	S.D.
Republic	Signal Hill Gasoline Company	8,000	Abs.	S.D.
13th & Palm	Signal Hill Gasoline Company	12,000	Abs.	Op.
No. 1	Southwestern Engineering Corp.	1,800	Abs.	S.D.
No. 2	Southwestern Engineering Corp.	2,500	Abs.	Op.
Assoc-Pierce	Standard Gasoline Company	6,060	Comb.	Op.
Assoc-Miley-Keck	Standard Gasoline Company	4,970	Comb.	Op.
Huntington "A" Lease	Standard Gasoline Company	10,866	Comb.	Op.
Huntington "A" Lease	Standard Gasoline Company	6,918	Comb.	Op.
Huntington "B" Lease No. 2	Standard Gasoline Company	8,750	Comb.	Op.
Huntington "E" Lease	Standard Gasoline Company	24,000	Comb.	Op.
Copeland Lease	Union Oil Company of California	5,000	Abs.	Op.
Fee Property	Wilshire Oil Company	25,000	Abs.	Op.
Inglewood Field				
Rubel Lease	Petroleum Securities Company	7,000	Abs.	Op.
Rindge	Shell Company of California	6,000	Abs.	Op.
Assoc-Vickers	Standard Gasoline Company	7,000	Comb.	Op.
Baldwin-Cienaga	Standard Gasoline Company	3,660	Comb.	Op.
L. A. I. No. 1	Standard Gasoline Company	17,209	Comb.	Op.
Long Beach Field				
Plant No. 1	California Gasoline Company	4,000	Abs.	Op.
Plant No. 2	California Gasoline Company	7,000	Abs.	Op.
Plant No. 3	California Gasoline Company	4,000	Abs.	Op.
Plant No. 7	California Gasoline Company	8,000	Abs.	Op.
Harlow Kent Lease	California Gasoline Company	6,000	Abs.	Op.
Walnut & Hill St.	General Petroleum Corporation	5,000	Abs.	Op.
Jergins City Lease	Lomita Gasoline Company	10,000	Abs.	Op.
Fee Property	Pan American Petroleum Company	9,000	Comb.	Op.
Ramsey Lease	Reservoir Hill Gasoline Company	12,000	Abs.	Op.
Interstate Lease	Ryan & Hackett	1,200	Abs.	Op.
Coseboom	Shell Company of California	30,000	Abs.	Op.
Atlantic Ave.	Signal Gasoline Co., Inc.	9,000	Abs.	Op.
Plant No. 1	Signal Gasoline Corporation	9,000	Abs.	Op.
Plant No. 2	Signal Gasoline Corporation	8,500	Abs.	Op.
United-Haas Lease	Signal Hill Gasoline Company	8,000	Abs.	Op.
United-Dennison	Signal Hill Gasoline Company	5,000	Abs.	Op.
L. B. No. 1	Standard Gasoline Company	2,947	Comb.	S.D.
L. B. No. 2	Standard Gasoline Company	3,545	Comb.	Op.
L. B. No. 3	Standard Gasoline Company	24,000	Abs.	Op.
Midway Field				
Balboa Lease	Balell Gasoline Company	4,000	Abs.	Op.
Gralan Lease	Gralan Oil Company	400	Abs.	S.D.
Honolulu Lease	Honolulu Consolidated Oil Co.	30,000	Abs.	Op.
Cal-Pet. Pl. No. 6	Lovell Gasoline Corporation	2,500	Abs.	Op.
Boston Pac. Lease	Lovell Gasoline Corporation	2,000	Abs.	Op.
North Amer. Consol.	Lovell Gasoline Corporation	6,000	Abs.	Op.
Sec. 28-B	North American Oil Consolidated		Abs.	Op.
Sec. 23-D	Standard Gasoline Company	30,000	Abs.	Op.
Sec. 16-D	Standard Gasoline Company	5,500	Comb.	Op.
Sec. 7-D & 9-D	Standard Gasoline Company	10,000	Comb.	Op.
Sec. 1-C & 2-C	Standard Gasoline Company	11,500	Comb.	Op.
Sec. 31-B	Standard Gasoline Company	4,500	Comb.	Op.
Sec. 36-R	Standard Gasoline Company	5,500	Comb.	Op.
Sec. 33-G	Standard Gasoline Company	2,500	Comb.	S.D.
Sec. 19-G	Standard Gasoline Company	4,500	Comb.	Op.
Sec. 29-G	Standard Gasoline Company	4,750	Comb.	Op.
Sec. 36-B	Standard Gasoline Company	8,500	Comb.	S.D.
Sec. 30-D	Standard Gasoline Company	375	Comb.	S.D.
King Lease	St. Helens Petroleum Co., Ltd.	2,500	Abs.	Op.
Schultz Lease	St. Helens Petroleum Co., Ltd.	2,500	Abs.	Op.
Montebello Field				
Baldwin Lease	California Gasoline Company	3,500	Abs.	Op.
Baldwin Lease	Standard Gasoline Company	8,826	Comb.	Op.
Temple Lease	Standard Gasoline Company		Booster	Op.
Monterey Lease	St. Helens Riverside Properties	2,500	Abs.	Op.
Newhall Field				
P. C. O. Fee	Standard Gasoline Company	226	Comb.	Op.
Richfield Field				
Kraemer No. 2	Standard Gasoline Company	14,319	Comb.	Op.
Morse	Union Oil Company of California	17,000	Comb.	Op.
Bradford Lease	West Coast Refining Company	10,000	Abs.	Op.
Bradford Lease	West Coast Refining Company	20,000	Abs.	Op.
Rosecranz Field				
G. P.-Vaughn Lease	California Gasoline Company	4,000	Abs.	Op.
Padleford Lease	Cowan Oil & Refining Company	7,000	Abs.	Op.
Athens	General Petroleum Corp. of California	5,000	Abs.	S.D.
Producers Lease	General Petroleum Corp. of California	10,000	Abs.	S.D.
Vermont Lease	General Petroleum Corp. of California	5,000	Abs.	S.D.
Marine-Rosecranz	General Petroleum Corp. of California	2,000	Abs.	S.D.
United-Shollenberger	Signal Hill Gasoline Company	10,000	Abs.	Op.
Superior Maxwell	Standard Gasoline Company	2,370	Comb.	Op.
Rosecranz Lease	Union Oil Company of California	17,000	Abs.	Op.
Salt Lake Field				
Rancho La Brea Lease	Rancho La Brea Oil Company	5,000	Comb.	Op.

OCATION	COMPANY	DAILY CAPACITY (M.C.F.)	TYPE OF PLANT	STATUS
Santa Fe Springs Field				
Jasper Lease	Bankline Oil Company	30,000	Abs.	Op.
Steinly Lease	California Gasoline Company	6,000	Abs.	Op.
Getty-Baker Lease	California Gasoline Company	2,000	Abs.	Op.
C. C. M. O.	General Petroleum Corp. of California	10,000	Abs.	Op.
G. P. Lease	Norwalk Company	30,000	Abs.	Op.
Getty Lease	Rio Grande Oil Company	4,000	Abs.	Op.
Roberts Lease	Ryan & Hackett	1,400	Abs.	Op.
Assoc-Green	Standard Gasoline Company	5,497	Comb.	Op.
Santa Gertrudes	Standard Gasoline Company	15,000	Abs.	Op.
Santa Gertrudes	Standard Gasoline Company	8,296	Comb.	Op.
Central Fee	Standard Gasoline Company	627	Comb.	Op.
Bell Lease	Union Oil Company of California	12,000	Abs.	Op.
Surbeck	Wilshire Oil Company	25,000	Abs.	Op.
Surbeck	Wilshire Oil Company	25,000	Abs.	Op.
Santa Maria Field				
R. & G. Lease	American Natural Gasoline Corp.	7,500	Abs.	Op.
Rice Ranch Lease	Rice Ranch Oil Company	1,000	Abs.	Op.
Careaga	Shell Company of California	3,000	Abs.	Op.
Newlove	Union Oil Company of California	12,000	Abs.	Op.
Seal Beach Field				
Alamitos Heights	General Petroleum Corpl of California	20,000	Abs.	Op.
Alamitos Heights	Petroleum Securities Company	12,000	Abs.	Op.
Marland-Selover Lease	Signal Hill Gasoline Company	15,000	Abs.	Op.
San Gabriel Lease	Standard Gasoline Company	25,000	Comb.	Op.
San Gabriel Lease	Standard Gasoline Company	12,000	Comb.	Op.
Los Alamitos	State Gasoline Corporation	8,000	Comb.	Op.
Sunset Field				
Transport Lease	O. C. Field Gasoline Corporation	6,000	Abs.	Op.
Ethel "D" Lease	Lovell Gasoline Corporation	2,000	Abs.	Op.
Sec. 34-32-34	Lovell Gasoline Corporation	1,750	Abs.	Op.
El Dora	Signal Hill Gasoline Company	6,000	Abs.	Op.
United M. & T.	Signal Hill Gasoline Company	2,000	Abs.	Op.
Sec. 31-E	Standard Gasoline Company	5,000	Comb.	Op.
Torrance Field				
C. C. M. O. Lease	Export Refining Company	20,000	Abs.	Op.
Superior Lease	Lovell Gasoline Corporation	6,000	Abs.	Op.
Fee Property	Pan American Petroleum Company	1,000	Comb.	Op.
Marble Fee	Standard Gasoline Company	1,350	Comb.	Op.
Joughin Lease	Standard Gasoline Company	6,325	Comb.	Op.
C. C. M. O. Lease	Torrance Gasoline & Refining Co.	12,000	Abs.	Op.
Ventura Field				
So. Mountain Lease	California Gasoline Company	8,000	Comp.	Op.
Calumet	Calumet Oil Company	700	Comp.	Op.
	Cienaga Corporation	25,000	Abs.	Op.
Barnard Lease	General Petroleum Corp. of California	50,000	Abs.	Op.
Hartman Lease	Highway Gasoline Company	7,000	Abs.	Op.
Shields Lease	Montebello Oil Company	1,500	Abs.	Op.
Orton Lease	Petroleum Securities Company	12,000	Abs.	Op.
Gosnell	Shell Company of California	98,000	Abs.	Op.
Assoc-Lloyd No. 1	Standard Gasoline Company	12,000	Comb.	Op.
Assoc-Lloyd No. 2	Standard Gasoline Company	24,000	Comb.	Op.
Assoc-Lloyd No. 3	Standard Gasoline Company	30,000	Chamt.	S.D.
McGonigle-Lloyd	Standard Gasoline Company	32,000	Comb.	Op.
Torrey-Lee Lease	Union Oil Company of California	250	Abs.	Op.
Wheeler Ridge Field				
Kern Co. No. 2	Standard Gasoline Company	1,000	Comb.	Op.

1927-28 Gas Progress *in* Oklahoma

(Continued from Page 54)

Commanche, giving these towns an increased and more dependable supply. A distribution system at Blair was also installed by the company.

The Southwest Power Company, a gas and electric utility with headquarters at McAlester, Okla., laid an 8-inch line from Blocker to the Gainscreek field, replacing an old 6-inch line and eliminating the danger of a gas shortage at McAlester.

A 10-inch line was constructed by the Midwest Gas Company from the Chickasha field to the Fort Sill power plant. This is approximately 20 miles long and is connected to wells with 50,000,000 cubic feet daily capacity.

Development in the Logan County oil and gas area has brought gas to Roxana, Crescent and Lovell. Hennessey and Kingfisher have granted gas franchises and may also get gas from this field.

The Oklahoma Northern Utilities Company has constructed an 8-inch line to the Deer Creek field and through its associated company, the Deer Creek Pipe Line Company, has connected with a number of new wells in Northern Oklahoma. The Perry Service Company, serving Perry, also constructed about 12 miles of new line to connect with a line of Harris and Haun tapping the Blackwell field.

Nearly all gas distributing companies made enlargements, extensions and repairs to their systems. A number of them carried on campaigns for reduction of leakage.

Natural gas companies in Oklahoma are constantly on the alert to connect up with new sources of supply. At least three of the larger ones are expending over $1,000,000 a year in Oklahoma, obtaining new wells and leases, constructing, enlarging and relaying gas transportation and gathering lines to new fields, and making improvements to gas compressor stations and other machinery and equipment. The result of this steady campaign has been reduction of gas shortages to a minimum. A big portion of the intense construction activity of the past 15 months has been for the purpose of assuring a future gas supply rather than to meet present demands. In the face of all of these vast expenditures for new supply and improvement of service, gas rates have remained stable in this state during the past year, very few companies having asked for increases. Some in fact have been able to reduce certain rates.

SPECIFY ARCO PAINTS VARNISHES ENAMELS LACQUERS

THIS EMBLEM IS MORE THAN A MARK OF UNIFORMITY AND HIGH QUALITY. IT IS ALSO A PLEDGE OF CO-OPERATION AND A PROMISE OF SERVICE CHEERFULLY GIVEN. THIS HAS BEEN OUR POLICY SINCE 1881 . . . AND WE'RE GOING TO STICK TO IT FOR A LONG, LONG TIME.

THE ARCO COMPANY
CLEVELAND, OHIO

Pacific Coast Branch:
523 Rialto Bldg.,
San Francisco, Calif.

In Canada—The Arco Co., Ltd.
Toronto, Ontario

(161)

ARCO
Paints . Varnishes . Enamels . Lacquers

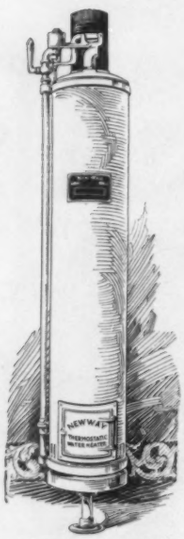
IT IS DIFFERENT
IT STARTS HOT

—

The Economy Way is the

New Way

THERMOSTATICALLY CONTROLLED



—

In the New Way the pilot light heats the water in the coils,—always—there is no re-heating of the coils and heater every time the hot water faucet opens.

The New Way saves gas, water and time.

—

Made and Guaranteed by

New Way Manufacturing Company, Inc.

894 FOLSOM STREET
SAN FRANCISCO

NATURAL GAS GASOLINE OPERATIONS

Compiled by E. T. Knudsen

Department of Commerce, Bureau of Mines, Division of Mineral Resources and Statistics

ONE hundred and thirty-six natural-gas gasoline plants with a daily indicated capacity of 1,457,150 thousand cubic feet, report a recovery of 41,721,024 gallons of natural-gas gasoline from 27,370,642 thousand cubic feet of gas treated in March. This is an increase of 241 barrels in daily average production.

Utilization of natural-gas gasoline amounted to 957,934 barrels, an increase over February of 5,309 barrels. Daily average utilization of 30,901 barrels was 1,143 barrels less than daily average production of 32,044 barrels.

Stocks of natural-gas gasoline at the end of March amounted to 586,520 barrels, of which 33,176 barrels were reported by natural-gas gasoline plant operators and 553,344 barrels by refinery operators. This is an increase of 35,424 barrels over February stocks. This stock figure of 586,520 barrels is approximately nineteen days' supply at the current rate of consumption.

Production of gasoline during the month of March amounted to 5,087,702 barrels, a daily average of 164,119 barrels. This is an increase in total production of 188,867 barrels or 3.85 per cent over February output and an increase of 360,352 barrels or 7.62 per cent over the output of March, 1927.

Of the total gasoline produced, 20,610 barrels were reported as finished gasoline produced by natural-gas gasoline plant operators. Production of gasoline from Cracking Processes increased in March to 649,923 barrels.

Stocks of gasoline show an increase of 406,476 barrels during March and at the end of the month amounted to 12,312,391 barrels. This stock figure includes 10 barrels of finished gasoline reported by natural-gas gasoline plant operators

CALIFORNIA NATURAL GAS GASOLINE PRODUCTION, DISTRIBUTION AND STOCKS

MARCH, 1928

PRODUCTION	Gas Treated M. C. F.	Natural-Gas Gasoline Produced (Gallons)	Gasoline Recovery per MCF Gas Treated
Type of Plant			
Oil Absorption	17,513,733	26,476,705	1.512
Compressor	253,647	292,975	1.155
Combination Comp. and Oil Absorption	9,603,262	14,882,514	1.550
Drip		68,830	
Totals	27,370,642	41,721,024	1.524

Finished Gasoline produced at plants, 20,610 Bbls.

DISTRIBUTION		
Stocks First of Month		551,096 Bbl.
Production during Month		993,358 "
Quantity Mixed with crude or unfinished oils	210,557 Bbl.	
Used in Blending at Refineries	612,552 "	
Stocks End of Month	586,520 "	
Used at Plants, Shortage and Evaporation Losses	5,238 "	
Balance	129,587 "	
	1,544,454 "	1,544,454 "

STOCKS				
Natural-gas Gasoline held by Natural gas Gasoline Plant Operators	1,393,381	Gals. or	33,176	Bbls.
Natural-gas Gasoline held by Refiners	23,240,448	" "	553,344	"
Totals	24,633,829		586,520	"
Finished Gasoline (Motor Fuel) held by Natural gas Gasoline Plant Operators			10	"

UVALDE FRANCHISE LET

J. G. Pundt has been granted a 30-year gas franchise in Uvalde, Texas, and has agreed to furnish gas to the city within six months time. The source of the supply will be from wells owned by Mr. Pundt, located 12 miles south of Uvalde.

BIDS TO SERVE HUTCHINSON

A gas franchise is being applied for in Hutchinson, Kansas, by the Rice County Gas, Electric & Power Co. Gas is supplied this company by the Larutan Pipe Line Company.

SERVICE BUTTONS TO PRAIRIE OIL AND GAS WORKERS

Gold service buttons have been awarded to 340 employees of the Prairie Oil & Gas Company for 10 or more years of continuous service to that organization. Forty-five of the group received jeweled pins denoting 30 years of service.

ESTABLISH NEW AWARD

The Executive Board of the American Gas Association has announced the establishment of the Charles A. Munroe Award to provide annually for the financial recognition of any individual who, in the opinion of the Executive Board, has made the most outstanding contribution during the year in the general interests of the gas industry. The earnings of a fund of $10,000 given by Charles A. Munroe will be available for this purpose.

UTAH COMPANY REVENUE GAINS

Net earnings of the Utah Gas & Coke Company for 1927 increased nearly $7,000 over the preceding year.

DROP HONOLULU RATES

Honolulu Gas Company, Ltd., Honolulu, T. H., has filed a petition with the Public Utilities Commission to reduce gas rates 2½c per M. cu ft., the minimum rate to remain at $1.25 per month.

Campaigning Appliances *in* Vancouver, B. C.

(Continued from Page 61)

sumption of these appliances will be over $5,000.

STRONG SUPPORT OF SALES WORK

Gas salesmen are divided into several crews, some of these are responsible for the sales of gas fires, while others are pushing gas ranges. Newspaper space is frequently devoted to bringing the advantages of these appliances before the public eye. The company operates the electric interurban trains and passenger coaches on the lower mainland of British Columbia, and gas fire and range cards are frequently displayed in these cars. The company also publishes a four-page leaflet known as "The Buzzer" which is distributed among the thousands of riders on its cars. From time to time tactful reference is made to gas fires and ranges in this publication.

The company also publishes a magazine known as "Utility Topics." This magazine is delivered to all the gas and electric light consumers served by the company along with their bills. The gas department gets approximately half the space in this book, and while a portion is given over to editorial matter of a nature which makes the book interesting and valuable to the receiver, at the same time gas appliance advertisements receive good display space. They are also referred to in the cooking instructions in connection with the recipes given, and are interwoven with the text of the stories.

The latest activity of the gas department of the company, in-so-far as its merchandising program is concerned, is the formation of a domestic science department. The staff of this department holds gas cooking schools in various districts of the territory served, and its effective work is already seen in increased sales in the areas visited.

Gas appliance sales should take another jump this summer, thinks J. Fremont, new business manager, when the company's $200,000 appliance store and showroom, now under construction in Vancouver, is completed, affording larger and better facilities for scientific merchandising.

TRENCHING IN LARAMIE

R. Y. Lisco, Jr., who is installing a gas distribution system in Laramie, Wyoming, announces that 12 miles of trench are being dug in that community, line installation to follow shortly.

ANOTHER MILHAM GASSER

Milham Exploration Company has brought in its fourth gasser in the Buttonwillow district, San Joaquin Valley, California. Kern No. 4 is now making 10,000,000 cu. ft. of gas daily. A fifth well is under way, with 50,000,000 cu. ft. of gas production now developed by the company.

TO SERVE LINDSBORG

Lindsborg, Kansas, will receive natural gas service as a result of a franchise granted the United Light and Power Corporation of Kansas, work on the gas distributing system to begin 30 days after the acceptance of the franchise.

SELLS FORT SMITH COMPANY

United Public Service Company of Chicago has purchased the gas distribution system of the Fort Smith Light & Traction Company, Fort Smith Arkansas, a Byllesby property.

SPRAGUE METERS

Represent Twenty-five Years of Progress

We are proud of our Service in the West

Sprague Meter Company

BRIDGEPORT, CONNECTICUT

Los Angeles, California — San Francisco, California

Davenport, Iowa — Houston, Texas

HOT-N-KOLD

The Hot-N-Kold Shops are now serving the public in eight cities in the northern part of California with Kelvinator Refrigeration, Holbrook Ranges, Welsbauch Water Heaters, and other major appliances.

A valuable business franchise awaits the right dealer in every town.

HOT-N-KOLD CORPORATION

949 Mission Street — **San Francisco, California**

The M-J-L Automatic Fire & Damper Control

A highly efficient and reasonably priced regulator for controlling oil or gas fires together with stack damper. The damper is controlled in perfect synchronism with the fire. Assures proper combustion at all times and maintains constant steam pressure under a variable load

MOREY JONES & LOVELL, INC.

922 S. Hemlock TUcker 1916 Los Angeles

Firing Pottery *by* Gas

(Continued from Page 47)

mately 3,500 gallons and consume about 175,000 cu. ft. of 1100 B.t.u. natural gas.

TEMPERATURE CONTROL

The temperature of the kiln throughout the burn is controlled by pyrometric cones and electrically operated pyrometers, but chiefly by cones. Pyrometric cones are a ceramic mixture in convenient form used to denote the fusion point of clay bodies, but they are not accurate in the determination of temperatures and are not used for this purpose. Cones will fuse at higher or lower temperatures accordingly as the heat is applied quickly or slowly and low temperature cones, especially, are materially influenced by the character of the kiln atmosphere. Since cones are ceramic mixtures, they are especially valuable in measuring the temperatures required by other ceramic mixtures, by reason of the fact that both are similarly affected by kiln conditions.

The cones are set up in what is known as a cone plaque ranging in number anywhere from three to six cones to the plaque, depending upon the desired temperatures and kind of ware being fired. The plaques are placed during the setting of the ware in view of the peepholes at the top, center and bottom of the kiln in order that they may be observed throughout the burn. (See accompanying table for cone temperatures.)

In some plants the firing schedule is predetermined and a curve is plotted for the burner to follow. If the ware is a new line of product, samples of the cones are kept with the temperature curve for future reference and comparison until some schedule is definitely decided upon.

After the burning has been completed the ware is allowed to cool slowly to prevent cracking Finally it is removed from the kiln, sorted and placed in the warehouse ready for market.

END POINTS OF PYROMETRIC CONES*

(Heated in air at the rate of 150° C. per hour)

Cone No.	*Temp. °C*	*Temp. °F.*
.022	590	1094
.021	620	1148
.020	650	1202
.019	680	1256
.018	710	1310
.017	740	1364
.016	770	1418
.015	800	1472
.014	830	1526
.013	860	1580
.012	890	1634
.011	920	1688
.010	950	1742
.09	970	1778
.08	990	1814
.07	1010	1850
.06	1030	1886
.05	1050	1922
.04	1070	1958
.03	1099	1994
.02	1110	2030
.01	1130	2066
1	1160	2120
2	1163	2129
3	1170	2138
4	1190	2174
5	1205	2201
6	1230	2246
7	1250	2282
8	1260	2300
9	1285	2345
10	1305	2381
11	1325	2417
12	1335	2435
13	1350	2462
14	1400	2552
15	1435	2615
16	1465	2669
17	1475	2687
18	1490	2714
19	1520	2768
20	1530	2786
23	1580	2876
26	1595	2903
27	1605	2921
28	1615	2939
29	1640	2984
30	1650	3002
31	1680	3056
32	1700	3092
33	1745	3173
34	1760	3200
35	1785	3245
36	1810	3290
37	1820	3308
38	1835	3335
39	1865**	3389
40	1885**	3425
41	1970**	3578
42	2015**	3659

* C. O. Fairchild and M. F. Feters of the Bureau of Standards—J. Am. Ceram. Soc., 9 (11), 701-743 (1926.)

**In Arsem Furnace at 600 DEGREES C per hour.

Stockton
Fire Brick Company

FIRE BRICK, INSULATING BRICK
HIGH TEMPERATURE CEMENT

High Grade Refractories
for

GENERATOR LININGS
CHECKERS
BOILER SETTINGS

OFFICE:
Russ Building,
San Francisco

WORKS:
Stockton,
California

TUCSON ADDITIONS

J. D. Bowles, vice-president and chief engineer of the Federal Light & Traction Company of New York, announces an additional expenditure of $20,000 for gas plant equipment of the Tucson Gas, Electric Light & Power Company at Tucson, Arizona. A compressor plant to compress and dehydrate gas produced in Tucson is included in the additions. Mr. Bowles was in Arizona during April and went from Tucson to Deming, where a new gas plant is being constructed under the direction of Sam Headman, former manager of the Tucson utility, which is a unit of the Federal Light & Traction Company.

NEW ORLEANS PROSPECT

The City of New Orleans may be supplied with natural gas from wells being brought in by the Southern Gas Company, Inc., of Houma, La. It is understood that this company will submit a definite proposition to the city providing sufficient gas is found.

Swamp Lands Make Hard Going *for* Line Crews

(Continued from Page 59)

saving in time, effort and money.

After being welded, a 300-foot length of pipe was placed on a pontoon boat or flat boat which transported it to its place in the trench.

Here it was shifted to creosoted ties which had been placed along the trench, until it could be coupled together with that which had been previously brought. Dresser long sleeve couplings were used in this operation.

The flatboats loaded with the 300 feet of pipe were propelled by a cable line operating from a 10-ton tractor which was equipped with an over-sized cable drum. After the flatboats were relieved of their load, a tractor was used to draw them back along the trench to the welding rack where they would be reloaded. The guiding of the cable as it re-wound on the cable drum proved to be quite a problem. Considerable skill had to be exercised by the men whose task this was.

The method of dispatching between the two tractors which operated the pontoons was by telephone stations from both points of operation.

Before the line was lowered into the trench river clamps of a standard pattern weighing approximately 700 pounds each were placed on the line every 60 feet. These act as a ballast and also hold the pipe more rigidly in place at the point of coupling.

No artificial means were used to cover the line in the trench, since action of the water could be depended upon to cover it.

DALLAS FOXBORO OFFICE

The Foxboro Company of Foxboro, Mass., has established an office in Dallas, Texas, under the charge of J. B. McMahon, who was formerly associated with the Tulsa office of the company. The Dallas office is located in the Magnolia Bldg.

CONDITIONAL FRANCHISE

Arkansas Power and Light Company has been granted a conditional franchise for the serving of natural gas in Tuckerman, Ark. This city will be on the proposed line from Louisiana to St. Louis.

CITIES SERVICE SECURES GIRARD FRANCHISE

Girard, Kansas, has granted a natural gas franchise to the Cities Service Corporation with a vote at the polls of 683 favoring the franchise and 38 against it. A pipe line will be constructed from a point about one-fourth mile south of Pittsburgh to serve the city.

SIGNING GAS APPLICATIONS IN POPLAR BLUFF

The Missouri Natural Gas Company has been granted a franchise in Poplar Bluff, Mo., and is now signing gas applications within the city. If natural gas is not available within a two year period an artificial gas plant will be constructed.

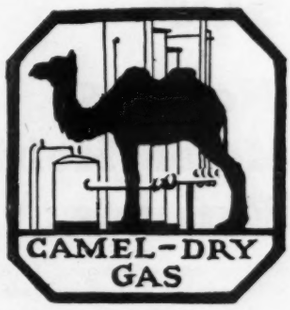
ARTESIA SERVICE READY

The Pecos Valley Gas Company anticipated turning on service in Artesia, New Mexico, on May 1st, the gas line from the field nine miles northeast of the city being nearly complete the middle of April.

COMPLETE PARSONS PROJECT

Completion of the 31-mile gas line from the field in Craig County, Oklahoma to the Katy railway shops at Parsons, Kansas, was announced early in April, the line having been laid at a cost exceeding $100,000.

Billions *of* Bubbles



Campbell Absorbers produce 3 times more than ALL others combined

A total of 489,700,000 gallons of natural gasoline were produced by ALL types of Absorbers in California during 1927. Of this total, Campbell Oil-Froth Absorbers produced 370,000,000 gallons, or

75.3%
of the entire total.

This record speaks for itself. It is one of the outstanding records in the oil and gas industry. Our Engineering Data will interest you.

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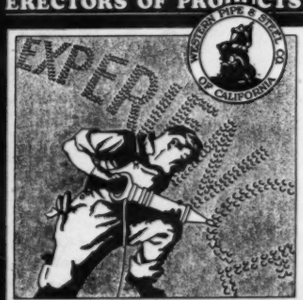
Natural Gas Engineer
Consulting, Designing, Constructing
P. O. Box 669 **LONG BEACH, CALIFORNIA**

Campbell
Oil-Froth Absorbers

W P & S

DESIGNERS, FABRICATORS & ERECTORS OF PRODUCTS OF **STEEL**



Investigate WESTERN Hi-Pressure Unit Gas Holders

WESTERN PIPE & STEEL COMPANY
OF CALIFORNIA
5717 Santa Fe Ave. LOS ANGELES 444 Market Street SAN FRANCISCO
FACTORIES
LOS ANGELES · SOUTH SAN FRANCISCO · FRESNO · PHOENIX · TAFT

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The Famous JOHNSON

No. 305 Soft Metal Melting Furnace

This sturdy, efficient, and economical furnace has a capacity of 300 pounds. It will melt soft metals and chemicals. Also used for oil tempering, hardening, etc. One of the outstanding features is the special draw-off valve which positively will not freeze. The pot has a removable lid. Four powerful Johnson Direct Jet Burners supply quick, intense heat without forced air blast.

The JOHNSON line includes various sizes and types of bench furnaces, melting furnaces, heat-treating furnaces, torches, burners, and gas appliances.

Please write for catalog containing full details of all Johnson products

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative—C. B. Babcock Co.
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Get an Option on Future Customers!

supply them with

ROCKGAS

A form of pure natural gas liquified under pressure in convenient sized tanks. Smallest, 12x37 inches, holds equivalent of 2666 cu. ft. 500 b.t.u. gas. Largest, holds equivalent of 36,550 cu. ft. of 500 b.t.u. gas. Many other sizes.

Pave the Way for Gas Extension

Install ROCKGAS in places where natural or artificial gas is not available. Give temporary service now, pending further extension of your gas mains. ROCKGAS now used and endorsed by homes, camps, stores, etc. throughout the United States.

A few rich California tierritories open for distributors. Write today for full details.

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Long Beach, Calif.

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

Portland Turns to Gas *for* Building Heating

GAS heating continues to grow in favor in Portland, Oregon. E. L. Hall, general superintendent of the Portland Gas & Coke Company, passes on the following observations to *Western Gas* readers on his company's heating load:

"When the Fremont M. E. Church was built five years ago in Portland there was not enough money to install a gas-fired heating plant according to the plans. Gas furnace units installed in different parts of the church as a temporary expedient did their work well. Now the church board is contemplating carrying out the original plans for a heating system and have asked for bids for installation.

"It has been noticed that vapor systems are growing in popularity. It is surprising to note the increasing demand for gas boiler installation for small and medium size business buildings formerly thought by us to be in the field of the oil burners. Investors perhaps see the advantage of gas heating more clearly than we do.

"We have gradually come to the point of installing gas-fired boilers without a capacity safety factor, that is, of installing a boiler with only sufficient capacity to supply the normal load, an unusual practice. No difficulty has been encountered nor is any anticipated on account of this practice.

"Insulation and weather stripping of residences is growing in favor among architects and builders. The writer cannot but believe that in Portland this is chiefly the result of gas company propaganda in this direction. It is surprising what little effort is required to put a good thing across."

AWATONNA WORKS ADDITIONS

A five-foot Steere water gas generator is being installed on the plant of the Interstate Power Company, Owatonna, Iowa, by the Semet-Solvay Engineering Corporation of New York. The installation includes standard Steere lining and a quick opening gate valve.

MANUFACTURING BRANCH AT DALLAS FOR L. A. COMPANY

The Wyatt Metal & Boiler Works of Dallas, Texas, has been appointed as Mid-Continent manufacturing branch for the engineering Research and Equipment Company of Los Angeles. J. E. Kobernick, vice-president and general manager of the Los Angeles organization, will be in charge of the Dallas office.

EYESIGHT SAVED

Friends of Bill Norton of the Electrogas Furnace Company, San Francisco, are congratulating him upon the recovery of his eyesight, endangered by an explosion of a bottle of aqua regia directly into his face while testing an acid proof paint.

PORTLAND COMPANY SAVES HOUR DAILY BY USING GAS

The Stenno-Ribbon Carbon Manufacturing Company has installed a gas boiler, replacing a wood-fired boiler. The gas boiler is equipped with a time clock so that steam is up and the kettles hot when the shop is opened in the morning. Formerly an hour was lost each morning getting things warmed up.

LAY MIDLAND MAINS

West Texas Gas Company is now laying mains in Midland, Texas, and gas will be turned on in that community about June 1.

STRONG CITY COUNCIL MAKES FRANCHISE OFFER

A franchise to supply Strong City, Kansas, with Natural Gas has been offered to the Twin Cities Gas Company by the city council.

THREE FIRMS ASK FORREST CITY CHARTERS

Three companies have applied for gas franchises recently in Forrest City, Arkansas. One application filed by John A. Reed of Cedar Rapids, Iowa, is for an artificial gas plant. The other two applications are from the Arkansas Natural Gas Company and the Arkansas Light and Power Company. The anticipated line from Louisiana to St. Louis through that section is the motivating influence behind the seeking of the latter franchises, it is thought.

TO SUPPLY CEMENT PLANT AT MILDRED, OKLA.

The Oklahoma Natural Gas Company is extending its line to Mildred, Oklahoma, where it will supply gas to the cement plant.

ANOTHER MEMBER OF A. G. A. FAMILY

The Public Utilities Association of Virginia has become affiliated with the American Gas Association through recent action of both associations. The A. G. A. now has a family of seventeen affiliated state and district associations and one geographic division.

REDUCES EUREKA RATES

The Pacific Gas and Electric Company has filed a voluntary reduction of rates with the California Railroad Commission for gas servic in Eureka and vicinity, formerly served by Western States Gas and Electric Company, which is now a subsidiary of the P. G. and E. A 20 per cent reduction in revenue is involved.

NEW BUSINESS CHANGE IN DOHERTY UNITS

A. W. Baker, for the past three and one-half years new business manager of the Kansas City Gas Company, Kansas City, Mo., has resigned, his place being taken by M. B. Buckley, formerly new business manager of Topeka. R. T. Hildenbrand, new business manager at Wyandotte has been advanced to the Pueblo Gas & Fuel Company and his place at Wyandotte taken by Jack Torbert, formerly new business manager of Newton Gas Company.

WARM AIR HEATING ASSN. HAS 15TH ANNUAL CONVENTION

One feature of the 15th annual convention, National Warm Air Heating & Ventilating Association, held at the Stevens Hotel, Chicago, Ill., April 24, 25, 26, 1928 was an address delivered the afternoon of the first day's session by R. M. Conner, director of the American Gas Association Laboratory at Cleveland, Ohio. Mr. Conner spoke on the subject, "Testing Central Heating Plants using Gas as Fuel."

HARRY WOLFGANG DEAD

Harry Wolfgang, salesman for the Unit System Heating & Manufacturing Company, Los Angeles, died at his home in that city on April 10th as a result of infected teeth.

An item in the March, 1928, issue of *Western Gas,* relating to the Clark County Gas Company supplying natural gas in liquid form to consumers in Las Vegas, Nev., should have stated that this liquid hydrocarbon fuel is marketed by the Imperial Gas Company.

Here Is Real Economy

Just consider the following fact . . . because you will have to consider it sooner or later . . . . . the cost of properly protecting a buried or exposed pipeline is usually about one-third of the cost of reconditioning the line.

That is why engineers and public utility companies have found such real economy in coating and spirally wrapping pipelines with Pioneer Rubbertex and Pioneer Pipe Covering . . . in making them immune to erosion, corrosion . . .acids . . . alkali . . electrolytic action . . . and temperature changes.

It will pay you, too. Better investigate them.

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Established 1888
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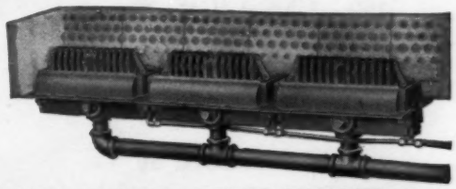
R. M. C. Gas Burner



R. M. C. RADIANT TILE Setting
ROTARY MANUFACTURING CO.
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KEY *Special* PIPE JOINT COMPOUND

Water-Proof

KEY SPECIAL PIPE JOINT COMPOUND will effectively seal screw thread and gasket joints for such service as Gas, Water, Steam, Compressed Air, etc.

One of the many advantages this compound has over the commonly used red leads and oils, etc., is that the pigment will not settle to the bottom of the container, thereby holding the contents in equal suspension at all times ready for service.

KEY SPECIAL PIPE COMPOUND is not a quick hardening cement but a plastic lubricant and filler that will seal the most obstinate joint with ease.

You may test the high quality of this product by taking a small quantity between the fingers which will immediately demonstrate the wonderful lubricating qualities along with the "pull or drag" that makes possible a permanent seal without resorting to cementing materials, most of which are very undesirable and impracticable to use.

Write for FREE Sample

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The Magic Way Company

Gas Heating Devices

including

"Magic Way" Gas Furnaces
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"Potter" Radiators
"Steel Made" Radiators
"Cole" Floor and Wall Heaters
"Hall" Floor Furnaces

Manufactured by

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National City San Diego California

UNACCOUNTED-FOR GAS IS REDUCED BY SURVEY

The Portland Gas and Coke Company has now covered 200 miles of their high pressure distribution system in an extensive block-by-block examination of both mains and services for leakage. Some interesting information as to the relative importance of various sources of leakage is revealed by the summaries of the leakage eliminated. It was found that over half of the leakage on the mains occurred at screw joints, while on services approximately half of the leakage was located at service clamps, cocks and valves.

Services were found to be decidedly heavier contributors to the total leakage than the mains, the proportion being approximately three to one. Many of the service leaks, particularly those on the exposed portions of the piping, had been known to exist by the customer but had never been reported.

As a result of this activity, together with other leakage elimination work done in the past few years, the unaccounted-for gas at Portland has been reduced to 175,000 cubic feet per mile of main per year.

BRANCH FACTORY IN TEXAS PLANNED FOR EVERLASTING

Erection of a new $50,000 branch factory in Texas is being planned by the Everlasting Paint and Sales Co, Los Angeles manufacturer of coatings for protection against rust and hydrolysis. The plant will be located in either Dallas or Houston and will have a capacity of 20,000 gallons a month.

Announcement of the plans was made by J. M. Page, district sales manager for Oklahoma and Texas.

NEW WAREHOUSE BUILDING FOR DENVER COMPANY

Work will soon begin on a new warehouse and service building for the Public Service Company of Colorado, to be erected in Denver at a cost of $486,000. The warehouse will be built at West 3rd Avenue and Lipan Street, and will house engineering departments and shops of the Denver utility. George Wehrle, superintendent of the company's gas department, is in charge of construction.

$13,000,000 FOR BETTERMENTS

Early in April the Arkansas Railroad Commission granted the Arkansas Natural Gas Corporation, Southern Utilities Distributing Company and Bethany Oil and Gas Company, associated companies with headquarters at El Dorado, permission to issue $13,000,000 worth of first mortgage bonds to cover improvements and extensions to the gas systems of the three corporations.

NEW DISTRICT OFFICE

B-Line Boiler Company, Cleveland, Ohio, formerly the C. L. Bryant Corporation, announces opening of new district branch office and display room at 2401-15 Chestnut Street, Philadelphia, Pa.

GAS FROM RUHR FOR PROVINCE OF HANOVER

According to the London Times, a contract has been signed on behalf of the entire province of Hanover with the Kohleverwertung AG Essen, providing for the supply in 1929 of all gas needed for commercial and domestic needs from the Ruhr district, a distance of 250-350 miles.

CEDAR FALLS CITY PLANT

Cedar Falls, Iowa, has authorized the issuance of $150,000 worth of bonds to purchase or build a municipal gas plant

PUEBLO ADMITS NATURAL GAS BY BIG MARGIN

Early in April voters of Pueblo, Colorado, indorsed the project for introducing natural gas to that community. The city's natural gas ordinance was passed by a majority of nearly five to one. This opens the way to use of gas in Pueblo from the Texas-to-Denver gas line now nearly completed, and also introduces a $250,000 repair and betterment program announced some time ago by A. M. Talbot, manager of the Pueblo Gas & Fuel Company.

NEW OWNERSHIP FOR EL PASO GAS COMPANY

Union Utilities, Incorporated, New York, has purchased the properties of the El Paso Gas Company, according to K. L. Simmons, vice-president and general manager of the Texaxs utility. H. G. Scott, former vice-president of Columbia Gas and Electric Company, is president of the Union Utilities, Inc. P. W. Chapman & Company, Inc., Chicago, were bankers in this transaction. Little change in personnel or policy is contemplated under the new ownership.

KANSAS LINE ANNOUNCED

Officials of the Kansas Pipe Line & Gas Company have announced the early beginning of a gas line from the McPherson County, Kansas, gas fields to Abilene, Junction City and Manhattan. Harrington, Chapman, St. Mary's, Wamego, and other points will also be served.

WYANOKA SERVICE SEEN BY OCTOBER 1

On April 3rd Wyanoka, Oklahoma, citizens voted a gas franchise to the Winchester Oil and Gas Company, gas to be in the community by October 1. Pipe-line construction is now in progress.

WILL EXERCISE FRANCHISE RIGHTS IN COLORADO

The Public Utilities Consolidated Corporation, which has taken over the Rocky Mountain Gas Company and the Otero Gas Company, has been granted permission to exercise gas franchise rights in La Junta, Rocky Ford, Swink, and Otero County, Colorado.

GILFILLAN APPOINTS JENSEN INSTRUMENT COMPANY

Jensen Instrument Company, Los Angeles, California, has been appointed special representative in California and Arizona for the Gilfillan line of pressure regulating and controlling devices for the oil and gas industries, according to the Gilfillan Machine Works, Inc, Ebenezer, New York.

P. G. AND E. EMPLOYEE GROUP NUMBERS 7,171

Membership of the Pacific Service Employees Association, employee organization of the Pacific Gas and Eelctric Company, now numbers 7,171, according to a recent report from executive secretary Carmody. Fifty-nine meetings were held by the association from January 1st to March 15, 1928, with a total attendance of 8,667 persons.

SOUTHERN OREGON GAS CO. PROPERTIES CHANGE HANDS

The Loveland Engineers, Inc., of San Francisco and Los Angeles, after making a survey in southern Oregon have purchased properties of the Southern Oregon Gas Company and will furnish gas to Medford, Ashland and Grant's Pass from the company's central plant at Medford.

What's Back of the Sale?

at

"Truck Tire Service"

Pneumatic Tire Service Facilities

Power strippers for making rapid tire changes, enabling us to remove tires that have become frozen to the rim in less than half the time consumed in performing the same operation by hand, and eliminating any possibility of injury to sidewall or bead.
Electrically operated buffers to clean rusty rims.
Power spreaders for inspecting the inside of casing.
Vulcanizing equipment for sectional and tube repairs; complete retreading equipment for retreading with the new Goodyear All-Weather Tread design.
Systematic checking of rims for loose fastenings and any irregularities.

Solid Tire Service Facilities

Two hydraulic presses for pressing on and off solid tires.
Trimming machines for smoothing up tires worn out of round.
Regrooving machines for renewing the non-skid design of the Goodyear All-Weather Tread.
Power device for turning idle wheels, eliminating necessity of removal during process of trimming tires.

Ten experienced tire mechanics to serve you! Everything in the way of modern equipment for tire service! All designed to save many hours of valuable time and make for lower tire costs!

"A Tire for Every Need"

Truck Tire Service Co.

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C. B. Babcock Company

"We Serve"

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FIRE BRICK

LININGS, CHECKERS and BOILER SETTINGS are carried in stock for quick shipment. If special or hand-made shapes are required, our plant is especially equipped to make them.

GLADDING, McBEAN & CO.

SAN FRANCISCO LOS ANGELES

PORTLAND SEATTLE

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Stauffer's

FERROX

Purifier

meets these essential requirements of a good Gas Purifier

A highly active Iron precipitate, with a high Iron content. A thoroughly impregnated and porous bulky mass, ready to use, no delay, always uniform.

A dependable source of supply

Pioneer manufacturers of Industrial Chemicals on the Pacific Coast

Stauffer Chemical Company

624-638 California Street, San Francisco, California

GAS USE DOUBLES IN FIVE YEARS FOR COAST VALLEYS

Gas consumption on the Monterey Peninsula, northern California, has practically doubled since 1922, according to figures released by J. F. Pollard, manager of the Coast Valleys Gas and Electric Company. The comparative figures are as follows:

	1922	1927
Gas customers.....	2,054	3,317
Cubic feet gas sold..	50,763,000	100,520,200
Maximum day's output of gas.....	286,000 cu.ft.	450,000 cu.ft.

Gas improvements planned for this year in the Coast Valleys territory include an additional lamp black separator, two gas scrubbers, an additional purifier, new water supply system, oil storage tanks and other miscellaneous equipment, all coming to a total of $55,000.

MANY CONSUMERS OUTSIDE OF INCORPORATED TERRITORY

According to a statement by A. F. Hockenbeamer, president of the Pacific Gas and Electric Company, that utility has 13,471 gas consumers living outside of incorporated territory.

LARGE GAS ENGINES IN POWER PLANT AT CHICKASHA

The Southwestern Light & Power Company has completed its new power plant at Chickasha, Okla., in which two 1650 HP. gas engines are installed.

GAS AND GASOLINE ON GOVT. LANDS IN WYOMING

Natural gas production on government lands in Wyoming last year decreased, but natural gasoline recovery from the gas increased. Gas production totaled 17,644,132,000 cubic feet on which the royalty amounted to $92,267, as compared with 19,258,360,000 feet in 1926, which netted royalties amounting to $105,631.

Natural gasoline recovered in Wyoming last year from gas produced on Wyoming last year from gas produced on U. S. lands totaled 35,655,211 gallons, as compared with 35,129,186 gallons in 1926. Royalties paid the government last year aggregated $109,639, of which $101,883 was paid by operators in the Salt Creek field where the largest gasoline plants are maintained.

SALT CREEK GASOLINE PLANT

Work has been begun by the Midwest Refining Company on a gas lift installation in the Salt Creek oil fields of Wyoming. The plant's gas capacity will be 10,000,000 cu. ft. daily, and natural gasoline production will probably run well over 15,000 gallons.

IMPERIAL GAS CO. MOVES

Officers of the Imperial Gas Company, manufacturer of "Rockgas," have been moved from 1871 Cherry Avenue to a new half-acre site at the corner of 32nd and Walnut Streets, Long Beach, Calif. The company now has 2400 Rockgas installations in operation in California, Arizona, Hawaii, New Mexico, Washington and Oregon.

PACIFIC GOODRICH TIRE AND RUBBER PLANT USES GAS

Another major gas-using installation has gone on service in Los Angeles, California—that of the Pacific Goodrich Tire and Rubber Company's new plant, which employs 1500 men and which on full production will turn out 5,000 tires and 7,500 tubes a day. Gas heat provides steam for the plant processes, the installation having a capacity of 120,000 cubic feet per hour. The plant is is on the lines of the Los Angeles Gas and Electric Corporation.

OKLAHOMA COALS DISCUSSED IN NEW GOVERNMENT REPORT

The characteristics of numerous representative Oklahoma coals are discussed in a report (Technical Paper No. 411) just published by the United States Bureau of Mines, Department of Commerce. The report is one of a series of devoted to the coals of the different states. Previously published papers dealt with the coals of Iowa, Kentucky, Ohio, Utah, Alabama, Pennsylvania, Virginia, Arkansas, Indiana, Missouri, and Tennessee.

The coal fields of Oklahoma are in the east-central and northeastern part of the State, according to C. L. Cooper, Chief Geologist of tne Oklahoma Geological Survey, who contributes to the report a chapter on the Oklahoma coal fields. The oldest area in point of development is in the east-central part of the State, in Pittsburg, Latimer, Le Flore, and Haskell Counties.

The area in Oklahoma underlain by coal measures is about 20,000 square miles in extent; of this area, 12,000 square miles is actually underlain with coal. There are seven beds of economic importance and a number of beds too thin to be valuable under present conditions of production. The workable beds range in thickness from 2 to 6 feet and in a few locatities from 7 to 8 feet. In the major part of the coal fields the average thickness of the beds worked is about 4 feet.

Oklahoma has produced coal since 1880. From that year to the end of 1926 the State has produced approximately 95,000,000 short tons of coal; its average rank has been fifteenth or sixteenth among the coal-producing States.

REPORT REVENUE INCREASE

Los Angeles Gas and Electric Corporation, operating in Los Angeles, Pasadena and vicinity, reports to the California Railroad Commission its 1927 operating revenue at $21,496,160.03, as compared with $17,566,-790.06 for 1926.

CONSUMERS NORTH OF BATON ROUGE GET GAS

The main line of the Interstate Natural Gas Company, north of Baton Rouge, La., is being tapped by the Baton Rouge Electric Company to bring gas to a number of consumers in that section. Gas was brought to Monte Sano during March from this line.

ANNUAL REVENUE UP

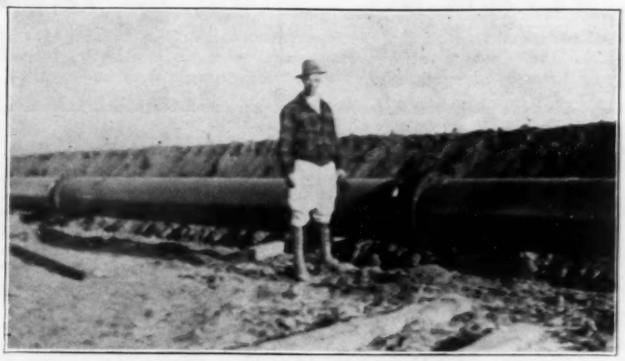
San Diego Consolidated Gas and Electric Company reports its 1927 operating revenue at $6,590,280.48, as compared with $5,767,-117.28 for 1926. The operating expenses, excluding taxes for 1927, are reported at $3,795,900.78, and at $3,394,634.84 for 1926, leaving net operating revenue of $2,794,379.70 for 1927, and $2,372,482.44 for 1926.

CITY PLANT INCREASES SENDOUT; HAS INTEREST DEFICIT

The annual report of operations of Nelson's municipal gas plant reveal for the year 1927 that 7,062,000 cubic feet of gas was supplied to customers in this British Columbia town. This is an increase of 672,639 cubic feet over the previous year. The plant has an operating surplus of $1,074, but failed by $2,307 to meet interest and sinking fund demands.

4500 NEW SERVICES IS GOAL FOR 1928 IN PORTLAND

Portland Gas and Coke Company expects to install 4500 new services this year, approximately 60 miles of new main to be added to their distribution system.



New Records in Pipe Line Laying

86.7 miles of 22" Dresser coupling pipe in 80 working days with one gang is a recent achievement of this company.

This line was tested to 400 lb. gas pressure with no leaks.

Just being completed is 99 miles of 10" welded pipe with one gang requiring only 60 working days.

Our modern equipment and efficient organization enable us to do first class work in record time.

Welded *Dresser* *Screw Pipe*

WELCOME TO DALLAS

To those attending the Natural Gas Convention in Dallas, May 7-10, we extend greetings and best wishes for a most happy and successful meeting.

OKLAHOMA CONTRACTING CO.

T. R. JONES, President H. A. GUMP, Sec'y.-Treas.

THE WELDALINE CO.

C. J. MURRAY

TULSA DALLAS

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124 West Fourth Street,
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Subscription: 1 Year. $2.00: 3 Years. $5.00. in Advance

A WESTERN GUIDE to INDUSTRIAL PURCHASING

Readers interested in any articles not listed in these pages are cordially invited to advise *Western Gas* of their wants and every effort will be made to furnish a list of the proper manufacturers. Addresses of companies listed on these pages may be found by consulting their advertisements in this issue.

Absorption and Compression Plant Equipment
Baker Iron Works.
J. A. Campbell.
Chaplin-Fulton Mfg. Co.
Fluor Construction Co.
Jackson Engr. & Equip. Co.
Jensen Instrument Co.
The E. A. Key Company
Western Pipe & Steel Co.

Absorption Towers
Baker Iron Works.
J. A. Campbell.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Adjustable Plugs
Lattimer-Stevens Co.
Western Pipe & Steel Co.

Agitators
Baker Iron Works.
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Aluminum Bronze Powder for Paint
W. P. Fuller & Co.
Hill, Hubbell & Co.

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Fort Worth Laboratories.
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Pacific Meter Works.

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Apparatus, Experimental Gas
The Bartlett Hayward Co.
Pacific Meter Works.

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Smith-Emery Co.

Automobile Tires
Truck Tire Service Co.

Bags, Gas Main
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.
Semet-Solvey Engr. Corpn.

Barometers
Fort Worth Laboratories.
Jensen Instrument Co.
Westcott & Greis, Inc.

Bench Iron Work
The Bartlett Hayward Co.
General Gas Light Co.

Blast Gates
Semet-Solvay Engr. Corpn.

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Gladding, McBean & Co.
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Stockton Fire Brick Co.

Blowers and Boosters
Ingersoll-Rand Co.
Connersville Blower Co.

Boiler—Brickwork
J. T. Thorpe & Son, Inc.

Boiler Equipment
E. A. Key Co.

Boiler Maker's Tools
E. A. Key Co.

Boilers, Gas-Fired
C. B. Babcock Co.
Baker Iron Works.

Boiler Settings, Pipe and Boiler Insulation
Pioneer Paper Company.
J. T. Thorpe & Son, Inc.

Boilers, Waste Heat
Baker Iron Works.
The Bartlett Hayward Co.

Boilers, Water Tube
Baker Iron Works.
Western Pipe & Steel Co.

Boxes
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Brass (rods, sheets, tubes, wire)
Mueller Co.

Breakers
Ingersoll-Rand Co.

Breeching (Boiler and Stack)
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Brick, Firebrick
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Brick, Firebrick—Installation
J. T. Thorpe & Son, Inc.

Brushes, Wire Pneumatic
Ingersoll-Rand Co.

Buildings, Steel
Baker Iron Works.
Western Pipe & Steel Co.

Bunkers, Steel and Concrete
The Bartlett Hayward Co.
Western Pipe & Steel Co.

Burners, High Pressure
Lee B. Mettler.
Rotary Manufacturing Co.

Burners, Low Pressure
C. B. Babcock Co.
The Bartlett Hayward Co.
General Gas Light Co.
Johnson Gas Appliance Co.
Lee B. Mettler.
Payne Furnace & Supply Co.
Rotary Manufacturing Co.
Standard Gas Equipment Corp.

Burners—Oil
Rotary Manufacturing Co.

By-product Recovery Apparatus
The Bartlett Hayward Co.
Oliver Continuous Filter Co.
Semet-Solvay Engr. Corpn.

Calorimeter Accessories
Fort Worth Laboratories.
Pacific Meter Works.

Calorimeters
Pacific Meter Works.

Cases, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Casinghead, Gas Meters
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.

Casing and Tubing (steel)
Semet-Solvay Engr. Corpn.
South Chester Tube Co.

Casing—Iron
South Chester Tube Company

Cast Iron Pipe
McWane Cast Iron Pipe Co.
Semet-Solvey Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Castings
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Cement
Stockton Fire Brick Co.

Cement, High Temperature
Stockton Fire Brick Co.

Cement—Plastic
Pioneer Paper Company.

Centrifugal Pipe
United States Cast Iron Pipe and Foundry Co.

Charging Machines (retort, etc.)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Checker Brick
Gladding, McBean & Co.
Semet-Solvay Engr. Corpn.
Stockton Fire Brick Co.

Chemical and Gas Testing Apparatus
Fort Worth Laboratories.
Pacific Meter Works.
Stauffer Chemical Co.
Westcott & Greis, Inc.

Chemists, Analytical
Fort Worth Laboratories.
A. R. Maas, Laboratories.
Smith-Emery Co.

Chimneys, Radial Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.

Chimneys, Radial Brick Installation
J. T. Thorpe & Son, Inc.

Chutes (coal, coke, ash)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Clamps and Sleeves, Pipe
S. R. Dresser Mfg. Co.
Mueller Co.

Clamps, Service
Mueller Co.

Cleaners, Service
C. B. Babcock Co.
Pacific Meter Works.

Coal Gas Plants
Charles R. Collins.
Semet-Solvay Engr. Corpn.
The Bartlett Hayward Co.

Coal Tar Products and Chemicals
W. P. Fuller & Co.
A. R. Maas, Laboratories.

Cocks
C. B. Babcock Co.
Johnson Gas Appliance Co.
Lattimer-Stevens Co.
Merco Nordstrom Valve Co.
Mueller Co.
Geo. D. Roper Corporation.

Collectors, Dust
Western Pipe & Steel Co.
Semet-Solvay Engr. Corpn.

Compressors, Air
The C. & G. Cooper Co.
Ingersoll-Rand Co.
Oliver Continuous Filter Co.

Compressors, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, High Pressure
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Compressors, Portable
Ingersoll-Rand Co.

Condensers
Baker Iron Works.
The Bartlett Hayward Co.
Ingersoll-Rand Co.
Semet-Solvay Engr. Corpn.

Condenser Boxes
Baker Iron Works.

Condenser Tubes
Semet-Solvay Engr. Corpn.

Controllers
Fort Worth Laboratories.
Jensen Instrument Co.
The Foxboro Co., Inc.
Robertshaw Thermostat Co.

Controls, Air and Steam
Jensen Instrument Co.
The Bartlett Hayward Co.
C. F. Braun & Co.
The Foxboro Co., Inc.

Cooling Systems
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Cooling Towers
J. A. Campbell
Fluor Construction Co.
J. B. Gill Corporation.
Jackson Engr. & Equip. Co.
Semet-Solvay Engr. Corpn.

Counters, Revolution
Fort Worth Laboratories.
Jensen Instrument Co.

Couplings
S. R. Dresser Mfg. Co.
The Bartlett Hayward Co.

Coverings (Tank, Boiler, Cold and Steam Pipe)
Pioneer Paper Company.

Cubic Foot Bottle
Pacific Meter Works.

Cutters, Pavement
Ingersoll-Rand Co.

Cutters, Pavement
Ingersoll-Rand Co.

Cylinders, Compressor
The C. & G. Cooper Co.
Semet-Solvay Engr. Corpn.

Dephlegmaters
J. A. Campbell
Semet-Solvey Engr. Corpn.
Western Pipe & Steel Co.

Diaphragms, Meter
Chaplin-Fulton Mfg. Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Diggers, Clay
Ingersoll-Rand Co.

Discharging Machines (retort, etc.)
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Displacement System, Tar
Semet-Solvey Engr. Corpn.

Door, Clean-out
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Drills
Ingersoll-Rand Co.
Mueller Co.

Drill Pipe—Iron
South Chester Tube Company

Drill Pipe—Steel
South Chester Tube Company

Dryers—Domestic Laundry, Commercial Laundry, Laboratory, Industrial.
The W. E. Lamneck Co.

Dryers—Blue Prints, Photograph film, etc.
The W. E. Lamneck Co.

Dryers—Dehydrating Fruits,
The W. E. Lamneck Co.

Elevators
Baker Iron Works.

Engineers and Engineering Service
J. A. Campbell
Charles R. Collins.
J. B. Gill Corporation.
The Bartlett Hayward Co.
A. R. Maas, Laboratories.
Smith-Emery Co.
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Engines, Diesel
The C. & G. Cooper Co.

Engines, Gas
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Oil
The C. & G. Cooper Co.
Ingersoll-Rand Co.

Engines, Steam
Ingersoll-Rand Co.

Evaporating Apparatus
The Bartlett Hayward Co.
C. F. Braun & Co.
United States Cast Iron Pipe and Foundry Co.
Southwestern Engineering Corp.

Excavators, Ditch and Trench
The Cleveland Trencher Co.

Exchangers, Heat
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell
Southwestern Engineering Corp.
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Exhausters
Connersville Blower Co.
Ingersoll-Rand Co.
United States Cast Iron Pipe and Foundry Co.

Experimental Apparatus
The Bartlett Hayward Co.
Pacific Meter Works.

Extractors
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Faucets, Drain
Mueller Co.

Felt—Deadening
Pioneer Paper Company.

Filters
Oliver Continuous Filter Co.
United States Cast Iron Pipe and Foundry Co.

Fire Clay and Products
Gladding, McBean & Co.
Stockton Fire Brick Co.

Fire Brick Contractors
J. T. Thorpe & Son, Inc.
Stockton Fire Brick Co.

Fittings
The Bartlett Hayward Co.
McWane Cast Iron Pipe Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Fixtures, Lighting (Domes, Portables, etc.)
C. B. Babcock Co.
Welsbach Company.

Feed Water Heaters
C. F. Braun & Co.
Southwestern Engineering Corp.

Fire Brick
Gladding, McBean & Co.
Stockton Fire Brick Co.
Semet-Solvay Engr. Corpn.

Flanges
Pittsburgh Equitable Meter Co
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

Flooring—Industrial
Pioneer Paper Company.

Forgings
Baker Iron Works.
Payne Furnace & Supply Co.
Pacific Gas Heating Co.
Geo. D. Roper Corporation.
J. T. Thorpe & Son, Inc.

Furnaces, Floor
Electrogas Furnace Co.
Magic Way Company
Payne Furnace & Supply Co.
Pacific Gas Heating Co.
Ward Heating Co.

Furnaces, Heating
Payne Furnace & Supply Co.
Pacific Gas Heating Co.
Magic Way Company.

Furnaces, Lead Melting
C. B. Babcock Co.
The Estate Stove Co.
Johnson Gas Appliance Co.
Mueller Co.
Payne Furnace & Supply Co.

Gas Analysis Apparatus
The Foxboro Co., Inc.
Fort Worth Laboratories.
Jensen Instrument Co.
Pacific Meter Works.

Gas Masks
Safety Gas Main Stopper Co.

Gas Main Tapping & Drilling Machines
Mueller Co.

Gaskets
The E. A. Key Company
Pittsburgh Equitable Meter Co
Safety Gas Main Stopper Co.
Semet-Solvay Engr. Corpn.
Southwestern Pipe Joint and Engineering Co.

Gasket Compound
W. P. Fuller & Co.
E. A. Key Co.

Gasometer
Pacific Meter Works.

Gas Pipe Line Construction
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Gauges
Fort Worth Laboratories.
The Foxboro Co., Inc.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Gauges, Steam
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Gauges, U Type
C. B. Babcock Co.
Fort Worth Laboratories.
Jensen Instrument Co.

SPEND $700,000 ON VANCOUVER GAS PLANT ADDITIONS

Equipment contracts for a new water gas plant and a new waterless gas holder have been let by the British Columbia Electric Railway Company, according to J. Keillor, gas engineer of the company, who has returned from a special trip to England for the purpose of awarding the contracts.

The new gas holder, of 3,000,000 cubic foot capacity, will be erected on the Old Royal City Mills site on Carrall Street, Vancouver, B. C. Work on the site is being started immediately and the holder must be completed by September, 1929. Foundations will be laid by the B. C. Electric Railway Company's own workmen.

A battery of purifiers has been ordered by the company and the contract let for two units of a water gas plant to be erected at Keefer Street, which will ultimately have a capacity of 25,000,000 cubic feet.

Work on the additions to the Keefer Street plant has also been commenced by the B. C. Electric construction gangs, with completion scheduled for December 1, 1928. The Keefer Street plant will then have an additional manufacturing capacity of 3,500,000 cubic feet.

The total expenditure on the two projects is estimated by Mr. Keillor to represent an investmnt of $700,000.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC.,

Required by the Act of Congress of August 24, 1912, of *Western Gas*, published monthly at Los Angeles, California, for April 1st, 1928.

State of California, County of Los Angeles, ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared Jay Jenkins, who, having been duly sworn according to law, deposes and says that he is the publisher of the *Western Gas*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and businses managers are:

Publisher—Jay Jenkins, Los Angeles, Calif.

Managing Editor—George H. Finley, Los Angeles, Calif.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Western Business Papers, Inc.
Jay Jenkins, Los Angeles, Calif.
James E. Jenkins, Los Angeles, Calif.
George H. Finley, Los Angeles, Calif.
H. Elliott Taylor, Los Angeles, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

JAY JENKINS, Publisher.

Sworn to and subscribed before me this 21st day of March, 1928.

(Seal) GLADYS L. KRAFFT.

(My commission expires June 23rd, 1929.)

"ASTCO"

Seamless Steel Line Pipe For Extreme High Pressures

"ASTCO" Seamless Steel Slip Joint Line Pipe is tested from 1000 to 1800 pounds pressure per square inch at the mill. The actual safety point is well beyond this figure, at which there is no indication whatever of leakage or other damage. In nine different tests beyond the regular mill test, "ASTCO" pipe has withstood pressures of from 2,845 to 5,120 pounds per square inch—well beyond any normal or abnormal service requirements.

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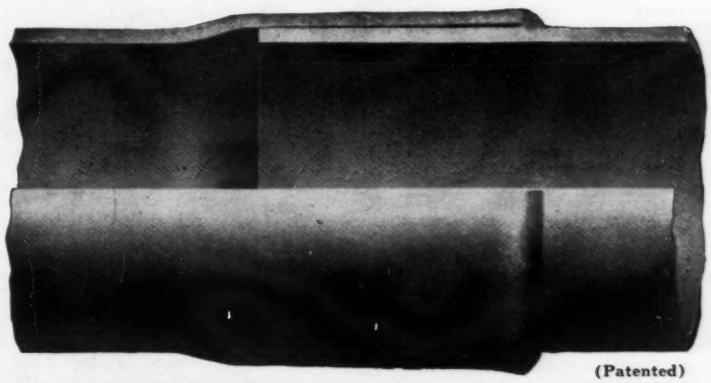

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Fire Brick Contractors

Established 1906

J. T. Thorpe & Son

Inc.

Specializing in Gas Generator, Boiler, Still and Furnace Brick, Industrial Furnaces, Retorts, Kilns, Brick Smokestacks.

A capable Engineering Department competent to advise on any problem involving firebrick construction.

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Safety Gas Main Stopper Co.
Semet-Solvay Engr. Corpn.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Generators, Water Gas
The Bartlett Hayward Co.
Baker Iron Works.
Semet-Solvay Engr. Corpn.

Glassware
Fort Worth Laboratories.
Westcott & Gries, Inc.

Governors
C. B. Babcock Co.
Chaplin-Fulton Mfg. Co.
Connelly Iron Sponge & Governor Co.
Pacific Meter Works.
Reynolds Gas Regulator Co.
Sprague Meter Co.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

Hammers
Ingersoll-Rand Co.

Hanger, Meter
Mueller Co.

Hangers, Iron and Steel
Baker Iron Works.

Heaters
C. B. Babcock Co.
Baker Iron Works.
C. F. Braun & Co.
The Estate Stove Co.
General Gas Light Co.
Magic Way Company.
New Way Mfg. Co.
Pacific Gas Heating Co.
Payne Furnace & Supply Co.
Welsbach Company.

Heaters, Floor
General Gas Light Co.
Magic Way Company.
Payne Furnace & Supply Co.

Heaters, Wall
C. B. Babcock Co.
General Gas Light Co.
Magic Way Company.
Payne Furnace & Supply Co.

Heat Exchangers
Baker Iron Works.
C. F. Braun & Co.
Southwestern Engineering Corp.
Semet-Solvey Engr. Corpn.
Western Pipe & Steel Co.

Heat Interchangers
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Southwestern Engineering Corp.
J. A. Campbell
Semet-Solvay Engr. Corpn.
Western Pipe & Steel Co.

Hoists
Ingersoll-Rand Co.

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The Bartlett Hayward Co.
Baker Iron Works.

Holders, High Pressure
Baker Iron Works.
Western Pipe & Steel Co.

Hoppers
The Bartlett Hayward Co.

Hose, Air
Ingersoll-Rand Co.

Hot Plates
C. B. Babcock Co.
Johnson Gas Appliance Co.
Geo. D. Roper Corporation.

Hygrometers
Fort Worth Laboratories.
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Incinerators
C. B. Babcock Co.
Baker Iron Works.
J. T. Thorpe & Son, Inc.
Western Pipe & Steel Co.

Incinerator Brickwork
J. T. Thorpe & Son, Inc.

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Westcott & Greis, Inc.

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Fort Worth Laboratories.
Jensen Instrument Co.
Pacific Meter Works.
The Foxboro Co., Inc.
Semet-Solvay Engr. Corpn.
Westcott & Greis, Inc.

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W. P. Fuller & Co.
Pioneer Paper Company.
Stockton Fire Brick Co.

Joint Runners Asbestos
Safety Gas Main Stopper Co.

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J. T. Thorpe & Son, Inc.
Western Pipe & Steel Co.

Kilns—Brickwork
The Bartlett Hayward Co.

Laboratory Supplies
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Mueller Co.
Westcott & Greis, Inc.

Ladles, Hot Metal
Mueller Co.

Lamps
C. B. Babcock Co.
General Gas Light Co.
Welsbach Company.

Lighters
C. B. Babcock Co.
Tappan Stove Co.

Lighting Incidentals
C. B. Babcock Co.
Welsbach Company.

Line Pipe—Iron
South Chester Tube Company

Line Pipe—Steel
Amer. Seamless Tube Corp.
South Chester Tube Company

Linings—Brickwork
J. T. Thorpe & Son, Inc.

Linings—Car
Pioneer Paper Company.

Main, Bags
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Mains, Street
United States Cast Iron Pipe and Foundry Co.

Main, Stopper
C. B. Babcock Co.
Mueller Co.
Safety Gas Main Stopper Co.

Mantles, Gas Lighting
C. B. Babcock Co.
General Gas Light Co.
Welsbach Company.

Manometers
J. A. Campbell
Fort Worth Laboratories.
Jensen Instrument Co.
Lee B. Mettler.
Westcott & Greis, Inc.

Meters, Air
Connersville Blower Co.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Boiler
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.

Meters, Burner Test
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Cast Iron Gas
The Bartlett Hayward Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meter Connections
Lattimer-Stevens Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Complaint
Pittsburgh Equitable Meter Co

Meters, Consumers
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Flow
The Foxboro Co., Inc.
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Meters, Fluid
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Gas
Connersville Blower Co
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Gasoline and Oil
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Meters, High Pressure Distribution
Fort Worth Laboratories.
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Pacific Meter Works.
Sprague Meter Co.
The Foxboro Co., Inc.

Meters, High Pressure Iron Case
The E. A. Key Company
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Industrial Consumers
Connersville Blower Co.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
The Foxboro Co., Inc.

Meters, Iron Case
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Laboratory
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Large Capacity
Connersville Blower Co.
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Oil
Connersville Blower Co.
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Orifice
Jensen Instrument Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
The Foxboro Co., Inc.
Robinson Orifice Fitting Co.
Westcott & Greis, Inc.

Meters, Oxygen
Fort Worth Laboratories.
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Oxygen and Hydrogen
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meters, Prepayment
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.

Meter Seals
Lattimer-Stevens Co.

Meter Shelves
Lattimer-Stevens Co.

Meter Swivels and Caps
Lattimer-Stevens Co.

Meters, Station
Connersville Blower Co.
The Bartlett Hayward Co.
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Meters, Steam
Jensen Instrument Co.
The Foxboro Co., Inc.
Westcott & Greis, Inc.

Meters, Test
Fort Worth Laboratories
Pacific Meter Works.
Pittsburgh Equitable Meter Co
Sprague Meter Co.
Westcott & Greis, Inc.

Meters, Water
Jensen Instrument Co.
Pittsburgh Equitable Meter Co
Westcott & Greis, Inc.

Meters, Wet Test
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Mixers, Gas and Air
C. B. Babcock Co.
Geo. D. Roper Corporation.

Oil Condenser Sections
Semet-Solvay Engr. Corpn.

Oil, Diaphragm
Pacific Meter Works.

Over Heat Control
Robertshaw Thermostat Co.

Oxide
C. B. Babcock Co.
A. R. Maas, Laboratories.
Stauffer Chemical Co.

Packing, Asbestos
Safety Gas Main Stopper Co.

Paint
The Arco Company.
Everlasting Paint & Sales Co.
W. P. Fuller & Co.
Pioneer Paper Company.
Hill, Hubbell & Company.

Photometers
Pacific Meter Works.

Pilots
Payne Furnace & Supply Co.
The Wilcolator Company

Pipe
Amer. Seamless Tube Corp.
McWane Cast Iron Pipe Co.
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.
Western Pipe & Steel Co.

Pipe Compound
E. A. Key Co.

Pipe, Copper
Mueller Co.

Pipe Covering
Hill, Hubbell & Company.
Pioneer Paper Company.

Pipe Couplings
S. R. Dresser Mfg. Co.

Pipe Cutters
W. W. Strickler & Bros.

Pipe—Iron
South Chester Tube Company

Pipe—Steel
Amer. Seamless Tube Corp.
South Chester Tube Company

Pipe Coils, Bends, Van Stone Joints, Gasketless Flange Joints, Welded Nozzle Headers
Semet-Solvay Engr. Corpn.
Southwestern Pipe Joint and Engineering Co.

Pipe Jointers
Mueller Co.

Plugs (testing mains and running service)
C. B. Babcock Co.
Jensen Instrument Co.
The Foxboro Co., Inc.
Safety Gas Main Stopper Co.
United States Cast Iron Pipe and Foundry Co.

Pre-Heaters
Baker Iron Works.
C. F. Braun & Co.
J. A. Campbell
Southwestern Engineering Corp.
Western Pipe & Steel Co.

Producers, Gas
Semet-Solvay Engr. Corpn.
United States Cast Iron Pipe and Foundry Co.

Provers, Meter
Pacific Meter Works.
Pittsburgh Equitable Meter Co

Pumps
C. B. Babcock Co.
Connersville Blower Co.
Ingersoll-Rand Co.
Mueller Co.
Oliver Continuous Filter Co.
Pacific Meter Works.
Geo. D. Roper Corporation.
Safety Gas Main Stopper Co.

Purifiers
Baker Iron Works.
The Bartlett Hayward Co.
Semet-Solvay Engr. Corpn.

Purifying Materials
C. B. Babcock Co.
Connelly Iron Sponge & Governor Co.
A. R. Maas, Laboratories.
Stauffer Chemical Co.

Purifiers, Oil Absorption
Western Pipe & Steel Co.

Pyrometers (Indicating and Recording)
Fort Worth Laboratories
Jensen Instrument Co.
Westcott & Greis, Inc.

Radiants
C. B. Babcock Co.
General Gas Light Co.

Radiant Heaters
C. B. Babcock Co.
General Gas Light Co.
Welsbach Company.

Radiators—Gas Fired
Magic Way Company.

Ranges
C. B. Babcock Co.
Detroit Vapor Stove Co.
The Estate Stove Co.
Geo. D. Roper Corporation.
Standard Gas Equipment Corp.
Tappan Stove Co.

Ranges, Closed Top
C. B. Babcock Co.
Geo. D. Roper Corp.
Standard Gas Equipment Corp.
Tappan Stove Co.

Receivers, Air
Ingersoll-Rand Co.
Western Pipe & Steel Co.

Recorders
Fort Worth Laboratories.
Jensen Instrument Co.
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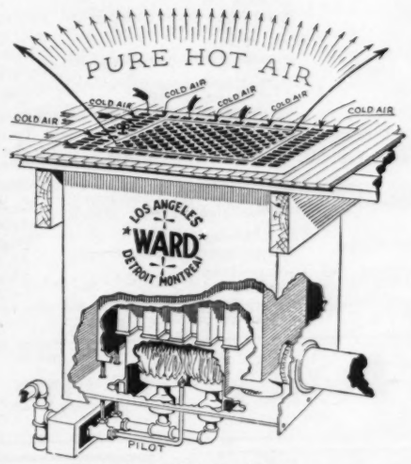

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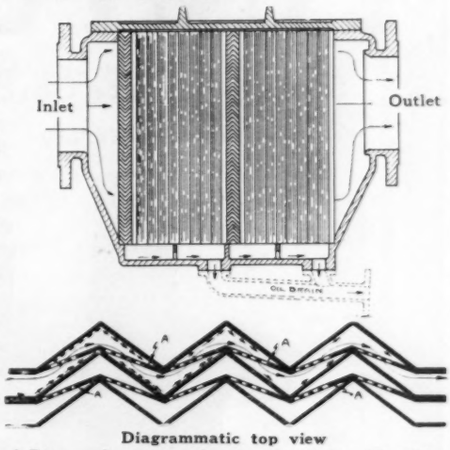

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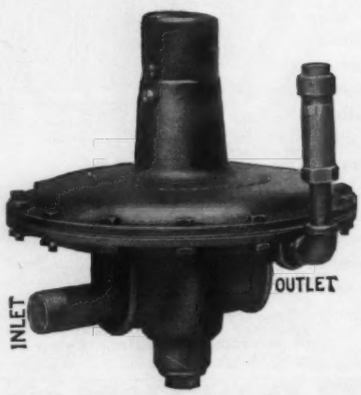

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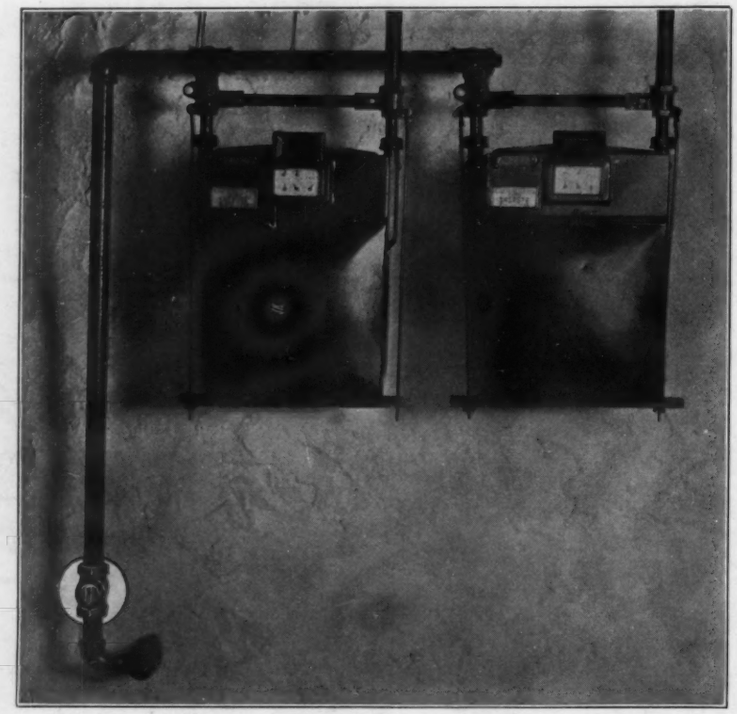

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